Products finishing

FRED W. VOGEL, Editor

Volume 5 JUNE, 1941 Number 9

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More Than 16,000 Circulation This Issue

Today, metal cleaning must be done right the first time, and in less time than ever before. Cowles Metal Cleaners meet these demands.

They furnish reserve strength to carry you over the hump on tough cleaning jobs. They save time and speed up production.

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"Cowles Metal Cleaners will get you out of trouble and keep you out of trouble."

THE COWLES DETERGENT COMPANY
Metal Cleaner Department
7016 EUCLID AVENUE CLEVELAND, OHIO

COWLES CLEANERS

"Cleaner Surfaces for Better Finishes"

THIS month the attention of the executives in the finishing field will be focused on the convention of the National Electroplaters' Society to be held in Boston, Massachusetts, during the week of June 9th. The attraction will be the opportunity which will be afforded for a review and open discussion of recent developments in methods and processes that may enable them to perform more readily and easily those tasks upon which our defense effort hinges.

The imposing list of distinguished speakers who have been selected as a result of their outstanding efforts in the finishing field to present papers at this convention have made every effort to provide material which will be of prime interest to each and every finishing department executive.

Of course everyone is extremely busy, but the four days taken out to attend this convention should be regarded as an investment upon which unusually good returns may be expected. The man who takes time out to attend this convention may obtain one new idea which, in the course of a year, may save him not only days but weeks of valuable time, or he may obtain technical information which may enable him to handle work which he otherwise would be forced to pass by.

Plan now to take a four-day vacation in this delightful and interesting section of New England and spend these four days in a profitable manner.

American Electro-Platers' Society 29th Annual National Convention June 9, 10, 11, 12

THE Boston Branch of the American Electroplaters' Society is planning to play host, during the week of June 9th to 12th, to one of the largest groups of Electroplaters ever to assemble for a National Convention. This year, the convention will be held at the Hotel Statler, in historic Boston, Massachusetts.

Careful planning of activities is evidenced by the well-balanced program which, from all indications, promises to be a "program to please all." Papers on topics of unusual interest to both the practical and the scientific plater have been selected for the educational meetings and the discussions of these papers will undoubtedly lead to the solutions of many problems and to the stimulation of thinking in the direction of improvements in plating methods and processes.

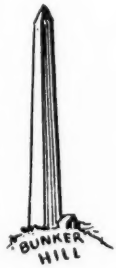
Those who attend the convention will be afforded an opportunity to meet the "key" men in the plating and finishing industry. Through these contacts, each individual may gain information on techniques and practices — the results of incalculable research and

innumerable years of experience. Two plant visitations on the program, one to the Whiting & Davis Co. in Plainville, Massachusetts, should be of keen interest to all visitors. The equipment and methods employed in these plants are excellent examples of fine New England craftsmanship.

The ladies who come with their husbands to the convention this year will find that the Boston ladies, under the chairmanship of Miss Ann Baker, have planned an unusually interesting program for their enjoyment. Included will be sight seeing trips to the interesting historical places in and around the city of Boston, a visit to a symphony concert, a guided tour through the Isabella Gardner Museum, informal parties, and other delightful events.

As in previous years, three of the outstanding events scheduled for the week of the AES convention are the International Fellowship Club Open House to be held at the Grand Ballroom of the Hotel Bradford, the Annual Outing to be held at Plymouth, Massachusetts, and the Annual Banquet and Dance to be held in the Imperial Ballroom of the Hotel Statler.

With such a varied and diversified list of events scheduled to take place during the convention, it is very easy to predict that the convention this year will be one of the most successful in the history of the American Electroplaters' Society.



The International Fellowship Club will hold its Annual Business Meeting on the first day of the convention for the purpose of electing officers for the forthcoming year and discuss the arrangements for the Open House. All suppliers and their representatives and friends are cordially invited to attend this meeting at the Hotel Statler, Monday, June 9th, at 12 o'clock noon.

NEW WRINKLE LICENSEES OFFER VITAL EXPERIENCE for the PRODUCT FINISHER in this HOUR of EMERGENCY and SUBSTITUTION

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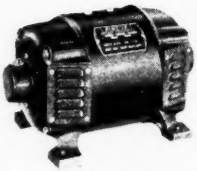
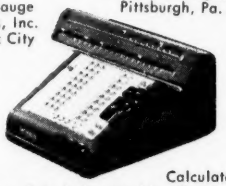
Grand Rapids, Mich.

Thickness Gauge
Carl Zeiss, Inc.
New York City

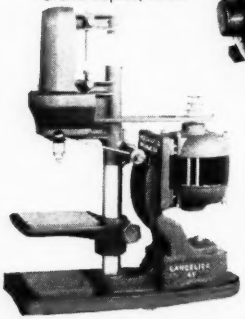
Unit Heater
Edwin L. Wiegand
Pittsburgh, Pa.



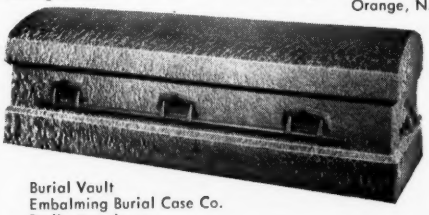
Rotary Converter
Pioneer Gen-E-Motor Corp.
Chicago, Ill.



Calculator
Monroe Calculating Machine Co., Inc.
Orange, N. J.



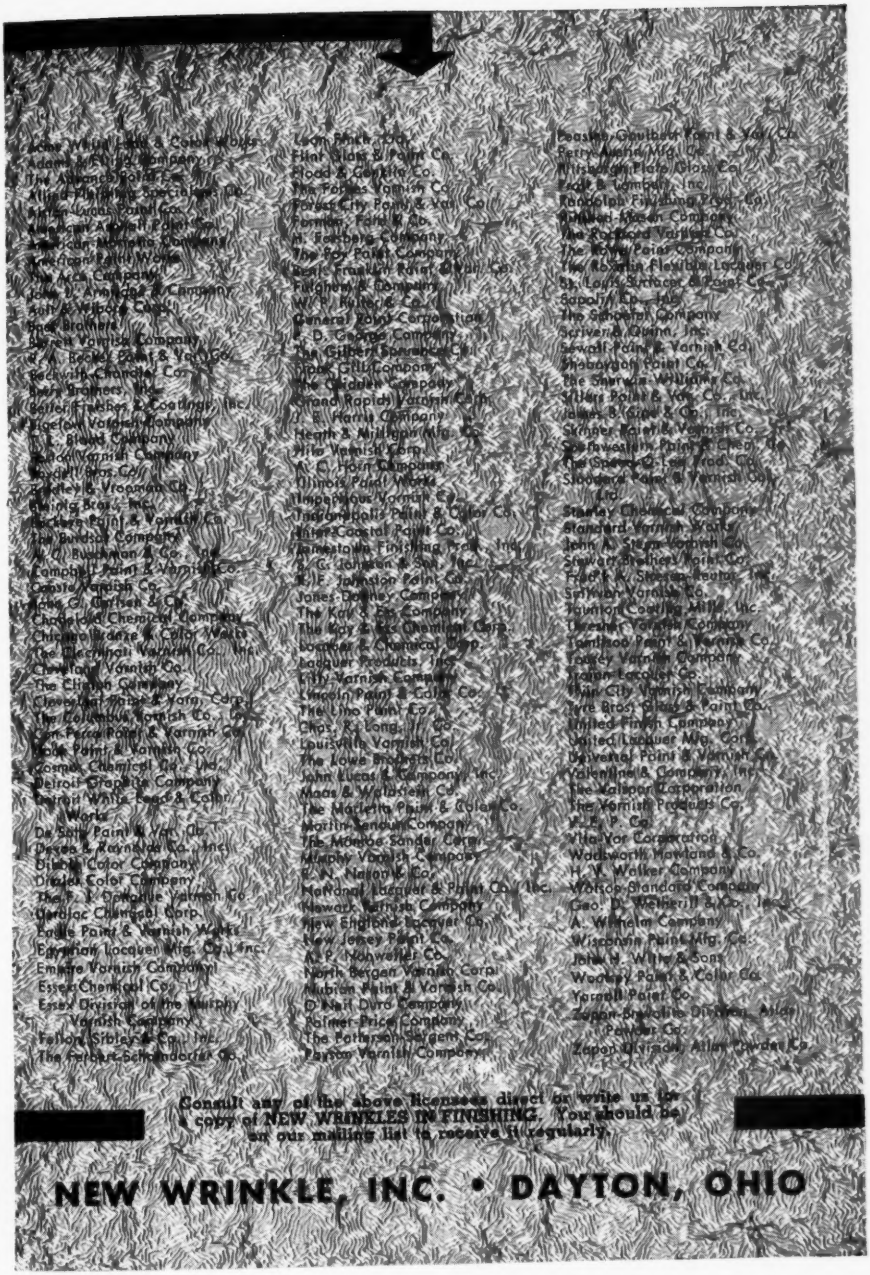
Bench Drill Press—Langelier Mfg. Co.
Providence, R. I.



Burial Vault
Embalming Burial Case Co.
Burlington, Iowa

U. S. Patents 1,688,882; 1,762,661; 1,851,385; 1,894,783; 1,879,316; 1,883,402; 1,896,894; 1,936,913; 1,943,417; 1,969,164; 1,976,191; 1,980,309; 1,991,523; 1,991,548; 2,037,331; 2,069,252; 2,077,112; 2,124,703; 2,154,954; 2,236,397; 2,236,792. Des. 86,001. Other patents pend. Aug. Canadian Patents—311,503; 311,504.

The products listed above are a representative selection of those which have received national acceptance and approval by NEW WRINKLE within the past year.


Acme White Lead & Color Works
Adams & Boyer Company
The Advance Paint Co.
Allied Finishing Specialties Co.
Archer-Daniels Paint Co.
American Asphalt Paint Co.
American Marietta Company
Anchor Paint Works
The Arco Company
John D. Arnaudet & Company
Ault & Wiborg Corp.
Bass Brothers
Bergen Varnish Company
W. A. Bickel Paint & Varnish Co.
Boecking Chemical Co.
Boyer Brothers, Inc.
Butler Finishes & Coatings, Inc.
Edgefow Varnish Company
E. L. Bland Company
Bond Varnish Company
Boyd Bros. Co.
Bradley & Vrooman Co.
Bruning Bros., Inc.
Buckeye Paint & Varnish Co.
The Burdick Company
W. C. Buchman & Co., Inc.
Campbell Paint & Varnish Co.
Casein Varnish Co.
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Chesterfield Chemical Company
Chicago Bronze & Color Works
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The Clinton Company
Cleveland Paint & Varn. Corp.
The Columbia Varnish Co., Inc.
Con-Fezo Paint & Varnish Co.
Cook Paint & Varnish Co.
Cosmos Chemical Co., Inc.
Detroit Graphite Company
Detroit White Lead & Color Works
De Soto Paint & Var. Co.
Devoe & Raynolds Co., Inc.
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Dreidel Color Company
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Fallon, Sibley & Co., Inc.
The Fetzer-Schneidewind Co.
Leon Finch, Jr.
Flint Glass & Paint Co.
Flood & Conklin Co.
The Forbes Varnish Co.
Forest City Paint & Var. Co.
Formica Paint & Co.
H. Forberg Company
The Fox Paint Company
Frank Franklin Paint & Var. Co.
Fulghum & Company
W. F. Fuller & Co.
General Paint Corporation
E. D. George Company
The Gilbert Spruance Co.
Glass Gill Company
The Glidden Company
Grand Rapids Varnish Co.
J. B. Harris Company
Heath & Milligan Mfg. Co.
Hilo Varnish Corp.
H. C. Horn Company
Illinois Paint Works
Imperial Varnish Co.
Indianapolis Paint & Color Co.
Inter-Coastal Paint Co.
Jamestown Finishing Prod., Inc.
S. C. Johnson & Son, Inc.
S. F. Johnston Paint Co.
Jones-Dabney Company
The Kay & Ess Company
The Kay & Ess Chemical Corp.
Kopman & Chemical Corp.
Lacquer Products, Inc.
Lilly Varnish Company
Lincoln Paint & Color Co.
The Lino Paint Co.
Chas. K. Long, Jr. Co.
Louisville Varnish Co.
The Lowe Brothers Co.
John Lucas & Company, Inc.
Maas & Waldstein Co.
The Marietta Paint & Color Co.
Martin-Senour Company
The Mengel Sander Corp.
Murphy Varnish Company
E. A. Nagamie Co.
National Lacquer & Paint Co., Inc.
Newark Varnish Company
New England Lacquer Co.
New Jersey Paint Co.
A. P. Nohweller Co.
North Bergen Varnish Corp.
Nubian Paint & Varnish Co.
O'Neil Dura Company
Palmer-Price Company
The Patterson-Sargent Co.
Payton Varnish Company
Peaslee-Gaulbert Paint & Var. Co.
Perry Austin Mfg. Co.
Pittsburgh Plate Glass Co.
Poor & Company, Inc.
Randolph Finishing Prod. Co.
Rathbun-Hixson Company
The Rockford Varnish Co.
The Rowe Paint Company
The Rosalia Flexible Lacquer Co.
St. Louis Surfacer & Paint Co.
Sapolin Co., Inc.
The Sarco-Tan Company
Scriven & Quinn, Inc.
Sewall Paint & Varnish Co.
Shaboygan Paint Co.
The Sherwin-Williams Co.
Silver Paint & Var. Co., Ltd.
Simms & Gow & Co., The
Skinner Paint & Varnish Co.
Smith-Hassler Paint & Chem. Co.
The Speer-O-Lac Prod. Co.
Standard Paint & Varnish Co., Ltd.
Stanley Chemical Company
Standard Varnish Works
John A. Stayton Company
Stewart-Bradley Paint Co.
Frank W. Steeper-Heaton, Inc.
Sullivan Varnish Co.
Taunton Coating Mills, Inc.
Thurber Varnish Company
Tomlinson Paint & Varnish Co.
Tracy Varnish Company
Transo Lacquer Co.
Twin City Varnish Company
Tyre Bros. Glass & Paint Co.
United Finish Company
United Lacquer Mfg. Corp.
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OFFICIAL PROGRAM

SUNDAY, JUNE 8th

3:00 P. M. Registration, Mezzanine Floor, Statler Hotel.
Registration fees: Gentlemen $5.00, Ladies $5.00 This entitles registrant to book of tickets to be used for all functions and activities. Membership in the Society is not necessary for registration.

MONDAY, JUNE 9th

8:00 A. M. Registration, Mezzanine Floor, Statler Hotel's Georgian Room.

9:00 A. M. Welcome to delegates, members, and visitors.
JOE BARRON, General Chairman.
Address—
WILLIAM JONES, President, Boston Branch.
Welcome to Boston—
THE HONORABLE MAYOR MAURICE J. TOBIN.
Presidential Address—
FREDERICK FULFORTH, President of the American Electroplaters' Society.
Business Session. Presentation of Credentials. General Reports.

11:00 A. M. Address—
DR. SAMUEL S. STRATTON, Office of Production Management, Washington, D. C.

2:00 P. M. First Educational Session.

8:30 P. M. International Fellowship Club—Open House, Grand Ballroom of The Hotel Bradford (few blocks from convention headquarters).

This evening's entertainment is sponsored by the International Fellowship Club.

Fun Music
Dancing Buffet Supper

TUESDAY, JUNE 10th

8:45 A. M. Second Educational Session.

12:00 P. M. Trip through the Whiting & Davis Plant, Plainville, Mass., manufacturers of ladies' mesh bags. Luncheon will be served at the Whiting & Davis Co. cafeteria by ticket only through the courtesy of The Frederick Gumm Chemical Co. (Buses leave Hotel Statler, 12:00 P. M. noon.)

3:30 P. M. Trip through the Warren Telechron Company, manufacturers of Telechron Clocks, Ashland, Mass. The world's largest electric clock manufacturers.

8:00 P. M. Third Educational Session.

WEDNESDAY, JUNE 11th

8:30 A. M. Outing. Buses leave promptly at 8:30 A. M. from the Hotel Statler for a beautiful morning tour to the landing place of the Pilgrim fathers. Historic Plymouth, Mass., and Pilgrim Shore; going through Quincy, Weymouth, Hingham, Duxbury, and Marshfield. This is a historical tour to the cradle of infant New England and through a region where still dwell the descendants of those who first landed on Plymouth Rock which you will see, and laid the foundations upon which our nation was builded. Here are beautiful ocean views, lakes, pine forests, and cape cottages, and here are typical New England villages, many of which have changed but little in three hundred years except to grow more beautiful with the passing of time.

Buses leave Plymouth at 1 o'clock for Pemberton Inn, Hull, Mass., for a real New England Shore Dinner (which is included in the registration booklet).

Ocean Swimming — East and West Baseball Game
Golf Tournament — Recreation Games

Final bus will leave Pemberton Inn for Boston at 5:45 P. M.

8:00 P. M. Fourth Educational Session.

THURSDAY, JUNE 12th

9:00 A. M. Fifth Educational Session.

1:30 P. M. Final Business Session, Georgian Room, Mezzanine Floor, Hotel Statler. Election of Officers. Selection of 1942 Convention City.

7:00 P. M. Banquet — Stage Show — Dancing. Hotel Statler Main Imperial Ballroom, Mezzanine Floor.

LADIES' PROGRAM

SUNDAY, JUNE 8th

3:00 P. M. Registration.

MONDAY, JUNE 9th

9:00 A. M. Attend opening of the Convention with the men. The ladies will then meet in the Imperial Ballroom Foyer of the Hotel Statler for an informal period to get acquainted and review the week's activities.

1:00 P. M. Luncheon served to the ladies in the Palm Room of the Hotel Statler.
The remainder of the afternoon, following luncheon, will be open.

8:30 P. M. The International Fellowship Club cordially invites all registrants, men and women, to attend their Open House and Buffet Supper, by ticket only, in the Grand Ballroom of the Hotel Bradford. There will be dancing and entertainment.

TUESDAY, JUNE 10th

9:15 A. M. Sight-seeing trip around Boston. The ladies will meet promptly at 9:15 A. M. in Room 419 of the Hotel Statler, which has been designated as the official meeting palce for the ladies throughout the remainder of the Convention. The buses, stationed outside the hotel, will leave promptly at 9:30 A. M. This tour should prove to be of great interest to out-of-state visitors, as well as native Bostonians. Stops will be made at such places as Bunker Hill Monument, Faneuil Hall, Old North Church, Old South Meeting House, Paul Revere House, Charles River Esplanade, Beacon Hill (Louisburg Square), Old State House, New State House (built by Bulfinch), and many other interesting places.

12:30 P. M. Luncheon will be served at the famous Seiler's 1775 House in Lexington, Massachusetts, where typical New England Atmosphere prevails. There will be a distribution of gifts with the compliments of the American Electroplaters' Society. A short rest period after lunch to prepare for the remainder of the sight-seeing tour.

2:00 P. M. Leaving the 1775 House, we will visit the historic towns of Lexington and Concord with stopovers at the famous battlefields. We visit the Cradle of American Liberty and the homes of America's foremost authors: Longfellow, Lowell, Hawthorne, Emerson, Alcott, and Thoreau.

7:30 P. M. The ladies will meet in Room 419 at 7:30 P. M. ready to leave by taxi for Symphony Hall to hear a "POPS" Concert by the Boston Symphony Orchestra under the direction of Arthur Fiedler. Light refreshments will be served during the concert through the courtesy of the M. E. Baker Company. Return to hotel by taxi.

WEDNESDAY, JUNE 11th

8:30 A. M. An all morning bus cruise down the Atlantic Coast for both men and women to historic Plymouth, the landing place of the Pilgrims, taking in Quincy, Weymouth, Hingham, Duxbury, and so on, on the way to the Cape. There will be a lecturer on each bus to explain the points of interest. At Plymouth we will see Plymouth Rock, Burial Hill, Pilgrim Hall, and famous Plymouth Harbor.

2:00 P. M. Lunch at Pemberton Inn in Hull, Massachusetts. There will be a short dinner such as New England only can serve. There will be music and dancing. Following the short dinner, the International Fellowship Club will sponsor a Beano Party under the direction of Joan Trumbour. Prizes will be awarded.

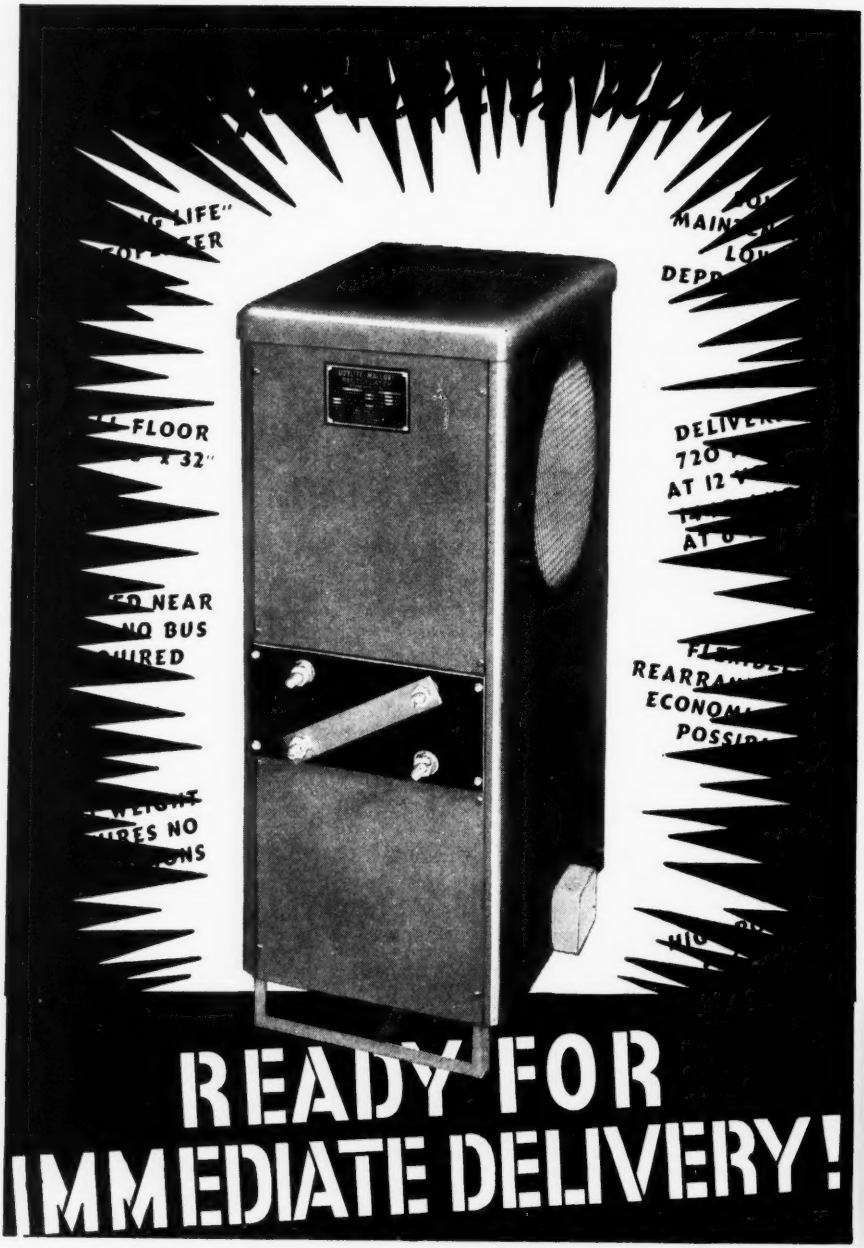
8:30 P. M. The ladies are cordially invited by David X. Clarin, Aunt E'la's Personal Secretary, to attend the Third Annual Party of the Aunt Ella Society in Parlors D and E of the Hotel Statler. There will be an old-fashioned song festival and light refreshments will be served. This party is made possible through the courtesy of the Oakite Products, Inc.

THURSDAY, JUNE 12th

10:15 A. M. The ladies will meet in Room 419 of the Hotel Statler ready to leave by taxi for the Isabella Stewart Gardner Museum, in the Fenway, where there will be a guided tour through the Museum. The Isabella Stewart Gardner Museum has one of the finest private collections of art in this country, and is especially famous for its Masterpieces of Italian Paintings.

AFTERNOON—OPEN

7:00 P. M. The Annual Banquet and Dance will be held in the Imperial Ballroom of the Hotel Statler. This will be the grand climax to Convention Week.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The Udylite-Mallory

STANDARDIZED FOR QUICK DELIVERY FOR PRICE ECONOMY

THERE IS AN AMPERE SHORTAGE—Every available manufacturing facility is being taxed to supply the deficiency, yet the accepted custom of building machines to customer order has about reached the limit of its output. Standardization is the only relief for such a situation.

ANSWER: THE STANDARDIZED RECTOPLATER—Four years ago, The Udylite Corporation prepared to build a standard unit of plating current generation called a Rectoplater, a unit to deliver a definite ampere output, built on straight-line production methods. The unit selected for straight-line production is now available for 440 volts or 220 volts, 3 phase, 60 cycle, and will deliver either 1440 amps. at 6 volts or 720 amps. at 12 volts.

THE RECTOPLATER IS FLEXIBLE—It may be used for either barrel or still tank plating.

With a plating barrel, it will usually lower plating time by 20 to 30 per cent for, being located right at the load, there is no loss of full voltage. Hence, extraordinarily high plating currents are obtainable.

Operated at 6 volts, the standard Rectoplater will care for a sizeable still tank and cleaner as well, the cleaner operating at 6 volts and the still tank at a reduced voltage through a tank rheostat.

In a number of cases, it has been possible by the addition of one or more Rectoplaters, to relieve part of the existing load on certain generators without rebuilding the bus or changing the generator foundations. The Rectoplater requires only 22″ x 32″ floor space.

GRIEF, ZERO—The Udylite-Mallory Rectoplater is a rugged, sturdy unit with an indefinitely long operating life. We have shipped over 200,000 amperes of plating-current capacity with not a single case of Rectoplater trouble.

MAINTENANCE, ZERO—With the Udylite-Mallory Rectoplater, there is no oiling, no brush replacement, no commutator repair. *Depreciation plus maintenance per ampere is lower than for any other type of apparatus in this service.*

PRICE ECONOMY—Standardization has lowered the price of the Udylite-Mallory Standard Rectoplater to about half that of custom-built machines.

Investigate the Udylite-Mallory Rectoplater. Our engineers will be glad to give you full details.

In order to maintain the schedule, all sessions will begin at the hours designated in this program.

FIRST SESSION

Monday Afternoon, June 9th, 2:00 P. M.
Georgian Room, Mezzanine Floor

JOHN E. COSTIGAN, Springfield Branch, Presiding

Arranged by the Educational Committee

A. W. COLLINS, Chairman

1—"Application of Salt Spray Test to Electroplated Coatings."
By DR. WILLIAM BLUM, National Bureau of Standards, Washington, D. C.

2—"Advantages and Objections to the Salt Spray Test from an Electroplating Point of View."
By ALBERT HIRSCH, Snyder, Inc., Philadelphia, Pennsylvania.

3—"The Use of Rubber in the Plating Room."
By C. P. McHUGH, Chemical Engineer, Manhattan Rubber Mfg. Division of Raybestos Manhattan, Inc., Passaic, New Jersey.

4—"Electropolishing."
By DR. H. H. UHLIG, Research Division, General Electric Company, Schenectady, New York.

5—"Measurement Significance and Control of pH in Cyanide Plating Baths."
By A. G. GRAY, Electroplating Division, E. I. du Pont de Nemours & Co., Wilmington, Delaware.

SECOND SESSION

Tuesday Morning, June 10th

8:45 A. M.

P. R. LYONS, Cleveland Branch, Presiding

W. Blum

1—"Composition of Cathode Films."

By ABNER BRENNER, National Bureau of Standards, Washington, D. C.

2—"Electrocolor and Patternplate."

By DR. J. E. STARECK, United Chromium, Inc., New York City.

3—"Nickel and Copper Deposition in the Printing Industry."

By JAMES E. DOWD, Electrotype Division, The Condé Nast Publications, Inc., Greenwich, Connecticut.

4—"Polishing Steel Specimens Prior to Plating for Exposure Test."

By GERALD A. LUX, Research Associate, A.E.S., Washington, D. C.

A. Brenner

5—To be announced.

W. M. Phillips

THIRD SESSION

Tuesday Evening, June 10th
8:00 P. M.

W. M. PHILLIPS, Detroit Branch,
Presiding

1—"Throwing Power of Plating Solutions."
By GEORGE B. HOGABOOM, Hanson-Van Winkle-Munning Co., Matawan, New Jersey.

2—"Effects of Impurities from Plating Solutions."
By DR. WALTER MEYER, Editor, Metal Finishing, New York City.

3—"Physical Removal of Impurities from Plating Solutions."
By WALTER A. HELBIG, Chemical Engineer, Darco Corp., New York City.

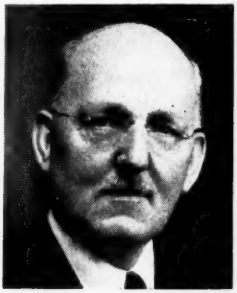
4—"Chemical and Electrochemical Methods for the Purification of Plating Solutions."
By O. A. STOCKER, Electrochemist, The Rufert Chemical Co., Division of The Seymour Mfg. Co., Seymour, Connecticut.

5—"Removal of Chromium Contamination in Alkaline Plating Solutions."
By DR. M. M. BECKWITH, J. B. Ford Sales, Wyandotte, Michigan.

6—"Electroplating Education."
By DR. C. B. F. YOUNG, Head, Institute of Electrochemistry and Metallurgy, New York Consultant.

C. B. F. Young

M. M. Beckwith



G. B. Hogaboom

No Foolin', Fellows!

The load may be too great for your present equipment —so why get out and pull? There really is no need to . . .

. . . just call on one of our trained men to outline the many ★advantages of our Full-Automatic Plating Machines:

- ★ **EVEN DISTRIBUTION OF PLATE**
- ★ **ABSOLUTE MINIMUM DRAGOUT (Due to the tilting of the work when transferring from one tank to another)**
- ★ **NO OVERHEAD CONSTRUCTION**
- ★ **LESS FLOOR SPACE**
- ★ **AUTOMATIC UNLOADING (Achieved in 9 out of 10 cases)**
- ★ **LOW HORSE-POWER CONSUMPTION**
- ★ **SIMPLICITY OF DESIGN**
- ★ **ECONOMY**

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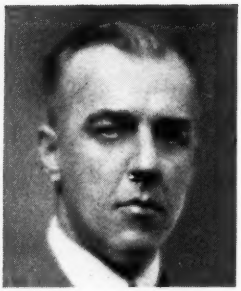


F. F. Oplinger

FOURTH SESSION

Wednesday Evening, June 11th

8:00 P. M.

DR. WALTER R. MEYER, Bridgeport Branch, Presiding

1—"The Uses and Limitations of Radiant Heat for Baking Organic Finishes."

By DR. GUSTAVE KLINKENSTEIN, Vice President, Maas & Waldstein Co., Newark, New Jersey.

2—"Modern Methods of Copper Plating."

By F. F. OPLINGER, Electroplating Division, E. I. du Pont de Nemours & Co., Wilmington, Delaware.

3—"Electropolishing Stainless Steel in Phosphoric Sulfuric Acid Baths."

By C. L. FAUST and H. PRAY, Battelle Memorial Institute, Columbus, Ohio.

C. L. Faust

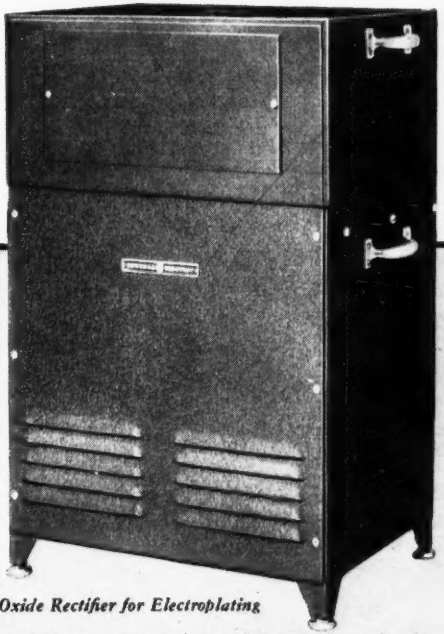
4—"Unichrome Copper."

By T. G. COYLE, United Chromium Corp., New York City.

5—"The Contamination and Cleaning of Cold Rolled Steel."

By EARNEST H. LYONS, JR., Chemist, The Meaker Company, Chicago, Illinois.

Pay for a New G-E Rectifier Out of Current Savings



G-E Copper Oxide Rectifier for Electroplating

1. Is it necessary for you to operate a large generator to supply power to only a portion of your tanks?

Just as it is more economical to have individual motor drives for individual machines in a machine shop—so it is much more economical to have individual rectifiers for individual tanks in the plating room. When you have one large generator to supply all of your tanks the operation becomes costly during periods of light load when only a few tanks are operating.

Individual rectifiers consume current only at the tanks which are actually being used. This means savings.

2. Do you use tank rheostats to cut down the voltage at some of your tanks?

This is commonly done. To determine this cost correctly, the original cost of the rheostat must be added to the cost of current dissipated in heat. The potential waste here is very great.

The G-E Regulator adjusts the A-c. input to the rectifier and gives a wide range of output adjustment without employing wasteful resistance in the low voltage D-c. circuit. Tank rheostats are unnecessary.

Pay for additional D-c. power which you need by eliminating present current waste! You can do it with G-E Copper Oxide Rectifiers. . . . send for more information now!

Section A-1705, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

GENERAL ELECTRIC

FIFTH SESSION

Thursday Morning, June 12th, 9:00 A. M.

CHARLES T. McGINLEY, St. Louis Branch,

Presiding

1—"Copper Oxide Rectifiers for the Electroplating Industry."

By I. ALBERT LEE, Bridgeport Branch.

2—"Die Cast Finishing."

By MARTIN F. MAHER, JR., New York Branch.

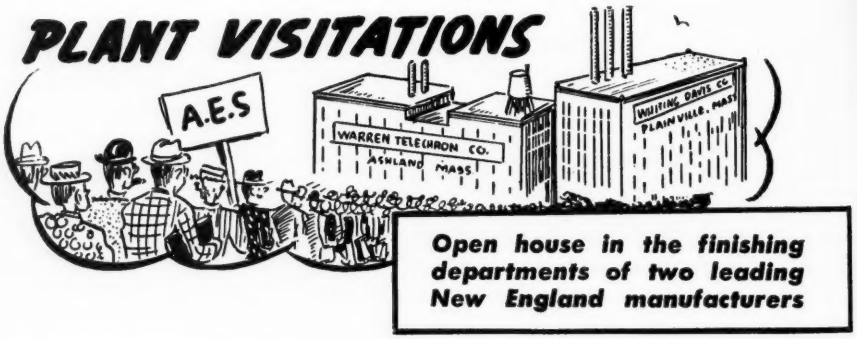
3—An Education Program for Everyone

By Rochester Branch.

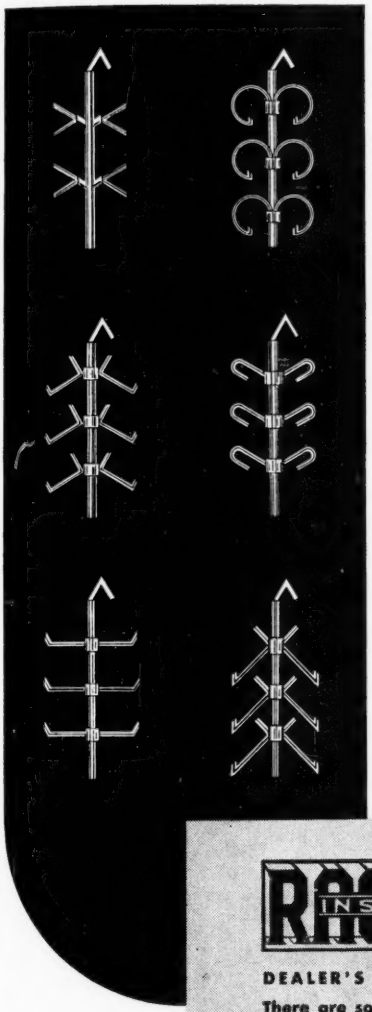
4—Cincinnati Branch—To be announced.

5—"Electrolytic Polishing."

By HAROLD M. LANG, New York Branch.



RACKOTE



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RACKOTE is a combination of lacquer and acid and alkali-resisting plastics. It is easily applied by dipping and air-dries in half the time of other insulations.

RACKOTE prevents seepage between rack and insulation and saves current and anodes. A thin film will endure long plating cycles. No taping is required.

RACKOTE can be thinned, if necessary, with ordinary solvents. It will not explode. Because it requires only half the number of coats and can be applied more quickly, RACKOTE actually costs less than half of many other installations.

Dealers in all principal cities in United States and Canada. If your dealer cannot supply you—write us for complete information.

RACKOTE INSULATION

DEALER'S NOTE

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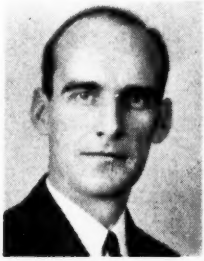
Joe Barron
General Chairman

DURING a year in which industrial production has increased more abruptly than ever before, and a year in which production men have had to assume new and greater responsibilities, the members of the Boston Chapter who are shown here took upon themselves an additional task—that of staging the 1941 Annual

Andrew W. Garrett

Ann Baker



Arthur W. Collins

Arthur J. Mintie | William Jones | Charles O. Hardy | Louis A. Gale

Convention of the American Electroplaters' Society.

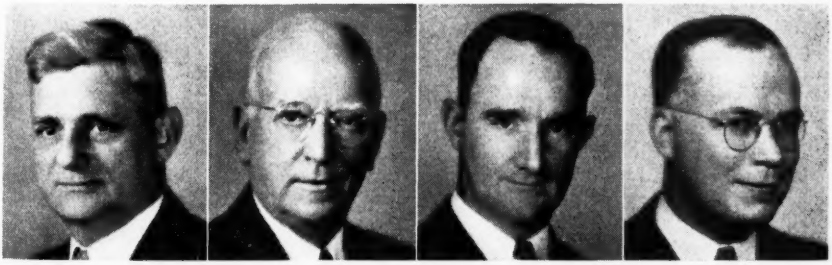
The manner in which these individuals have transformed a gigantic task of arrangements into a smooth running, coherent program of activities will be in evidence when the doors of the Statler Hotel, Boston, Massachusetts, swing open on the morning of June 9th to welcome the AES delegates, members and guests.

Upon the shoulders of these individuals has rested the responsibility of selecting material and speakers to form a well-balanced educational program, making arrangements for plant visitations, exhibits, banquet and entertainment, and all of the other details which are involved in the management of a National Convention.

To them, in recognition of their untiring efforts, should be given a large portion of the credit for the success of the 29th Annual Convention.

Louis Tosi

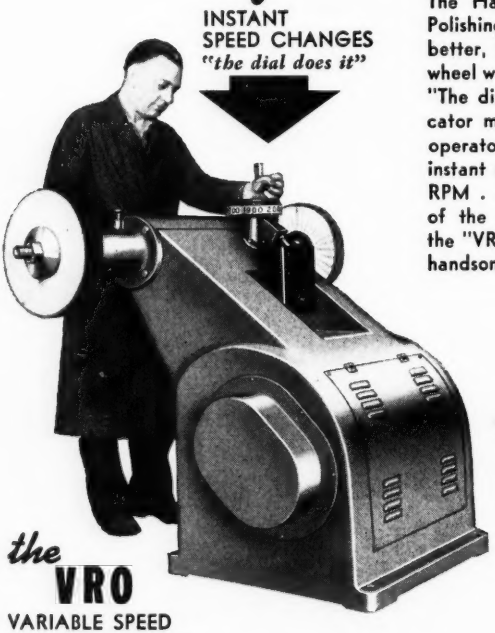
Louis V. Gagnon



Edward C. DeLorme | Frank J. Clark | George H. Loeser | Walter L. Larsson

UP goes production

Whatever you polish or buff... count on HAMMOND of KALAMAZOO for the MODERN answer!



The Hammond "VRO" Variable Speed Polishing Lathe is another way of saying better, more uniform finish . . . longer wheel wear . . . constant peripheral speed. "The dial does it" . . . that handy indicator mounted atop the machine at the operator's finger tips. Makes possible instant speed changes . . . 1500 to 3000 RPM . . . with one easy turn. In many of the country's finest polishing rooms, the "VRO" has paid its way and returned handsome profits. Will yours be next?

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For a wide range of circular die castings, brass goods, and plastics. High Production . . . High Quality Finish with ONE operator . . . polishing or buffing . . . are possible on a Hammond "J" Rotary Automatic. Just one of several Hammond Rotary types the "J" model will handle small flats, holding them by magnetic chucks. Rounds up to 10" diameter, can be handled either with continuous or indexing table. Many of America's finest finishing plants have reported almost unbelievable savings after installing the Hammond "J" Rotary. Send samples for prices and production estimate.

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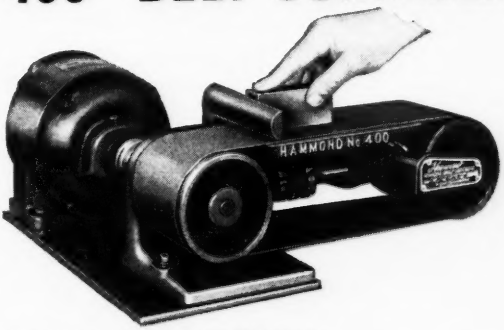
Almost any material you can name . . . plastics . . . lead . . . rubber . . . bone . . . wood . . . plastics of all kinds . . . is given brilliant polish quickly, efficiently with this small but versatile machine. Ruggedly built to machine tool specifications for lasting service. Operates in vertical or horizontal position with equal ease. And when vertical, it's easily converted into a wet machine by the addition of a simple pan and hood. For more information, ask for bulletin GP-2.



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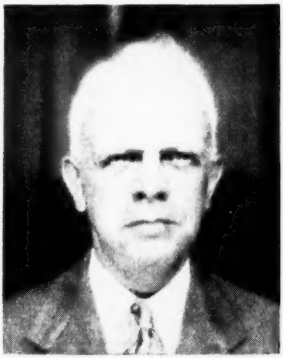

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Sunoco Spirits' high solvency penetrates the minute pores of the metal . . . rids them of oil and grease . . . leaves the metal sparkling clean and ready for the next process.

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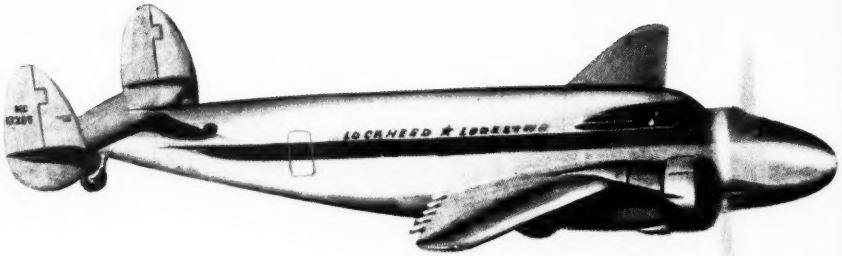


Anodizing Aircraft Parts

By PAUL P. MOZLEY

Engineer, Materials and Process Group, Lockheed Aircraft Corp., Burbank, California

THE increased use of aluminum and its alloys in recent years has invaded fields of industry where the products must resist the corrosive action of the most unfavorable conditions of climate or the effects of impure industrial atmospheres. Of the various industries not themselves connected with the producers of aluminum themselves, the Aircraft Manufacturing Industry is perhaps the most critical and exacting in its demands that surface finishing methods afford the best possible assurance of corrosion-free service.

Of all the known methods of surface protection, some form of anodic treatment in conjunction with inhibiting types of paint films seems to afford the most satisfactory and easily applied means of securing the desired results. Because of its general acceptance as a favorable method of surface anodization for general use in the aircraft factory, this discussion will deal almost entirely with the chromic acid method.

The formation of oxide coatings by anodic processes is not new, the first recorded use being by Buff in 1857 by the employment of sulfuric acid as the electrolyte. His failure to realize that the coating so formed was an oxide probably explains the lapse of some 40 years before the first patents were issued in 1898 in England to Pollak who used a mixture of soap and potassium dichromate as his electrolyte. These first uses of anodic films on aluminum were for the purpose of valve action in electrolytic rectifiers or condenser construction and not for the purpose of surface protection.

The first patents covering the use of chromic acid for the purpose of forming protective films of aluminum oxide as a means of obtaining resistance to corrosion were issued in England to Bengough and Stuart

in 1923. Their process, with only slight changes, forms the basis of the present methods employed in America for the chromic acid anodization of aircraft parts. In general, their method was to place the aluminum parts to be treated in a 3 per cent solution of chromic acid in water. The container, usually made of steel, was then made the cathode and the aluminum parts the anode, and the voltage applied was gradually increased to 40. After holding at 40 volts for 35 minutes, the voltage was increased to 50 volts for 5 minutes which ended the process and resulted in the formation of a very heavy gray coating of aluminum oxide. The double step voltage method produced such heavy films that no further protection was thought necessary and very good service has been obtained in many instances.

Due to patent regulations and the requirements of certain government specifications, the use of either a 3 per cent or a 5 per cent chromic acid content was required at the start of a new solution. The temperature was required to be kept at 91 to 99 degrees Fahrenheit and the voltage to be kept at 40 volts for 30 minutes after a slow rise from zero volts to 40 volts at the rate of 8 volts per minute. A final rinse in hot water, approximately 160 degrees Fahrenheit, completed the process by setting the oxide film that had been formed.

In order to understand more com-

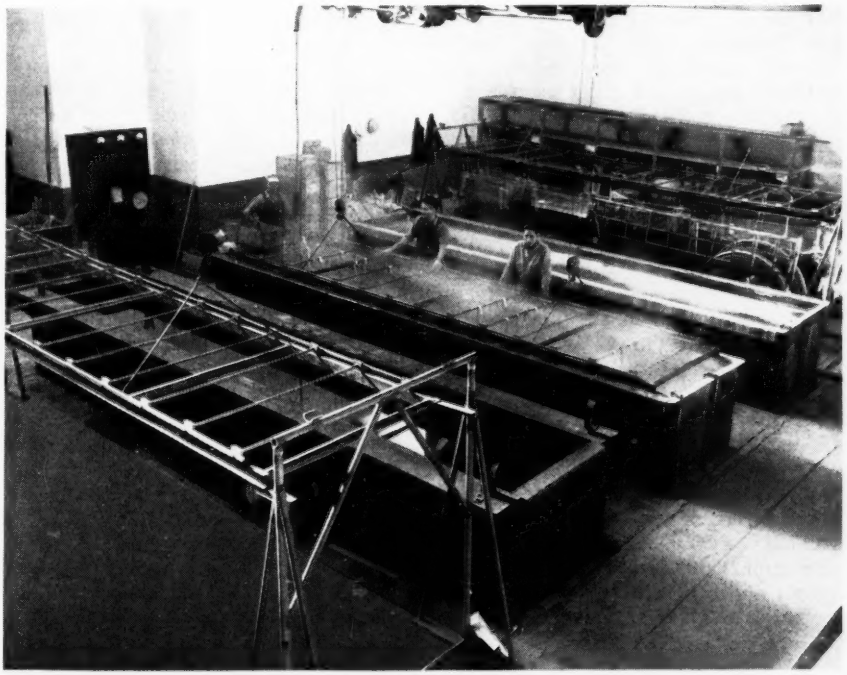


Fig. 1—A general view showing the layout of the Lockheed anodizing department.

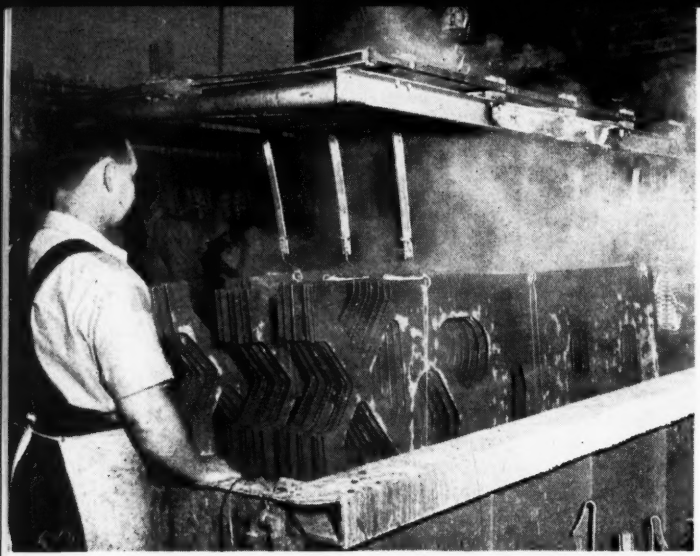


Fig. 2 — A closeup view of one cleaning tank located in the anodizing department.

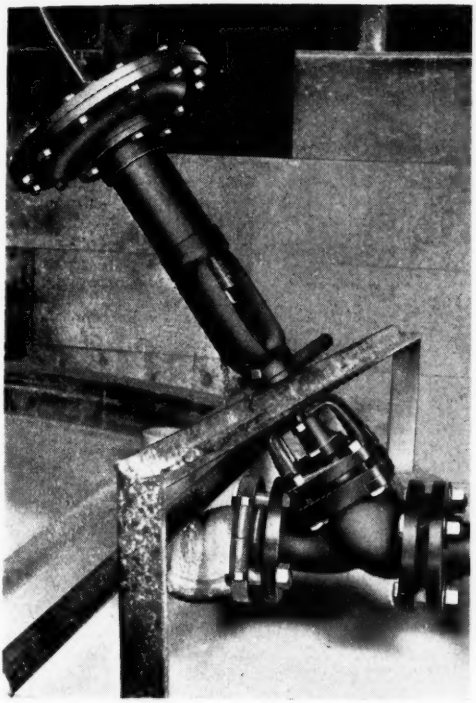
pletely the formation of these oxide coatings, we must visualize what actually happens during the anodization of an aluminum surface. Several theories of how the oxide film is formed have been advanced, but the one that seems the most simple and at the same time the most logical may be described as follows.

Formation of Oxide Film

The chromic acid radical is attracted to the positively charged aluminum surface and there liberates a portion of its oxygen which, in turn, forms an oxide of aluminum in a very finely divided form that adheres very tenaciously to the aluminum surface. The chromium then goes back to its position as part of an acid radical since the reaction is very similar to the electrolysis of any acid solution resulting in the breaking up of water and the liberation of oxygen and hydrogen. At this point, however, the similarity ceases and other factors begin to enter into the procedure. The acids present will be both chromic and dichromic and will be capable of reacting with the aluminum oxide that has been formed, and by so doing produce chromates and dichromates of aluminum, chromium and a series of double salts of aluminum and chromium, to say nothing of the basic salts of all these combinations.

The dissolving action of the acids present may, in the case of a very weak concentration, be so slow that an extremely thin film of oxide may completely insulate the surface from the effect of the solution and stop the action before sufficient oxidation has occurred to be of any benefit. Then, again, the opposite extreme of high acid concentration and its rapid dissolving action may completely remove the oxide film as fast as it is formed. In both cases, no appreciable oxide coating results and the process would be considered to be inoperative.

In the proper concentrations of acids, the dissolving action should be sufficient to produce small pores through which the contact between aluminum and the electrolyte may be maintained without excessive removal of the oxide layer. This will then result in a growth of oxide film by continued action of the aluminum surface until the combined valve (rectifying) effect and the resistance of the oxide layer approach the value that will allow almost no further action to take place. Current will, of course, continue to flow but the oxi-



Air-Operated Durichlor Y Valve used for quantity control of hydrochloric acid.

Mechanically Operated

DURIRON and DURICHLOR VALVES

Automatic control of the flow of corrosive solutions is being accomplished with Duriron and Durichlor valves equipped with air-operated diaphragm motors. The motors can be actuated by connecting with either indicating or recording temperature controls, or by remote manual control.

A typical installation is made on chromium plating work with one valve spring-opening and one spring-closing, directing the flow to either Duriron heaters or coolers. One valve or the other is open at all times as operating conditions require. There are many such installations in daily use where the temperature variations are held to plus or minus 1° F.

Other installations have been made with remote control for filling acid carboys from distant storage tanks.

Various types of valves are available for operation by motor or other mechanical means. For types of valves made in *Duriron*, *Durichlor* and *Durimet*, write for Bulletins No. 601 and No. 604.

Let us know your requirements and we will send you our recommendations.

The DURIRON COMPANY, Inc.
DAYTON, OHIO

dation and dissolving actions reach an equilibrium in about 30 to 40 minutes and continued operation of the process of little additional benefit.

tween 1.5 and 3 per cent seems to produce very similar films. In fact, films formed at the lower concentrations, resulting in a current density

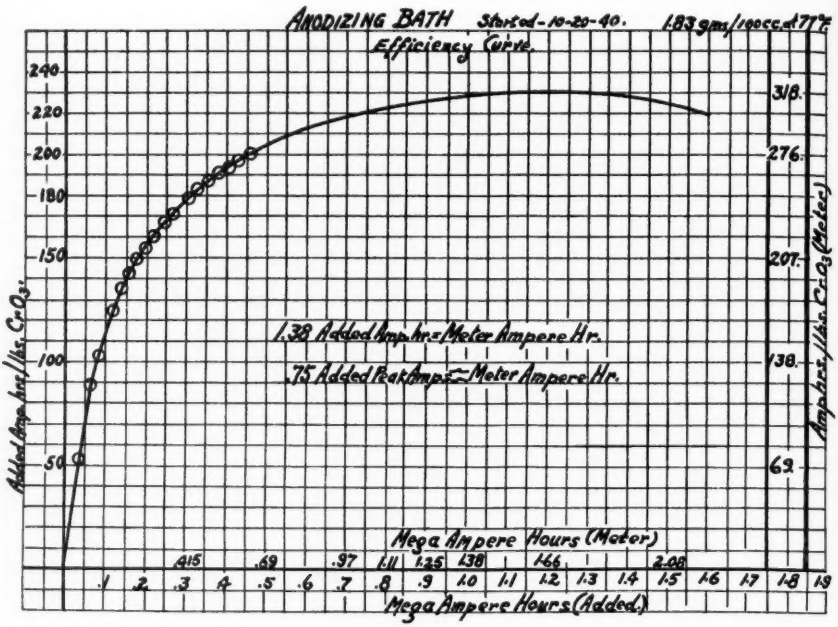
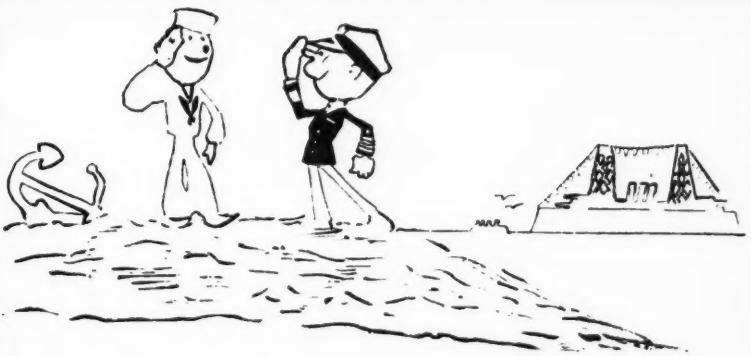


Fig. 3—Graph showing a normal efficiency curve of the anodizing bath in operation at the Lockheed Aircraft Corporation plant.

From the foregoing it will be seen that by controlling the acid concentrations one may produce coatings of any desired porosity and thickness and so obtain any degree of pore size needed for any particular application. As an example, films formed in a new solution containing 6 per cent chromic acid have been found to be about .0001 inch in thickness and of a porous nature, while those formed by a new 3 per cent solution measure only about .00004 inch in thickness but are much less porous or of a much more impervious nature. Any concentration of acid be-

of approximately 1 ampere per square foot of area being anodized, is the desired result upon which the writer's studies of shop control have been based.

Acid concentrations that will provide conductivity permitting a current density of .90 ampere per square foot will anodize satisfactorily and surfaces so processed will pass the 720 hour salt spray test now required by governmental specifications. This current density is about the minimum point at which satisfactory results can be obtained. However, any concentration of acid that results in



The Captain "missed the boat"

Perhaps you've already "missed the boat" and don't know it . . . if you're not using EXACTLY the right coating for your product. Considering the importance of finishing time and costs . . . the appearance of your product . . . you can't afford to use any finish but the best. It is possible that Stanley chemists may have the formula on file right NOW that will help cut your finishing costs . . . increase the salability of your product . . . ADD TO YOUR PROFITS. Your inquiry incurs no obligation. Address Department "F."

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high current density is not economical to operate and will result in reduced shop production capacity attainable with any given source of current supply. Since direct current is required, the source is generally a motor-generator set of limited ampere capacity.

Nature of Anodic Film

Before going further, some attention should be given to the nature of the coating formed and some of the present studies regarding its chemical composition. Recent investigations using X-ray diffraction methods have shown the presence of both amorphous aluminum oxide and the alpha crystalline hydrated form known as Bohmite (Al_2O_3) • (H_2O). In the case of the fine grain nonporous types of film, the grain size has been found to be so small that there would be no essential difference between colloidal or crystalline material. Along with the oxide of aluminum will also be oxides of any alloying constituents that are easily oxidized. Some of the substances usually present in aluminum alloys such as silicon and manganese-aluminum will be present as occluded particles imbedded in the aluminum oxide and will tend to color the anodic films. A coating of pure aluminum oxide is practically colorless or only slightly irridescent but the impure coatings formed on the various alloys may vary from a light gray to almost black.

Since the anodic film consists of a myriad of fine pores, it may be extremely absorbent in its nature and may readily absorb a considerable quantity of any coloring matter with which it comes in contact and often advantage is taken of this fact for producing ornamental effects. In obtaining paint adhesion the very fact that some of the chromic acid always remains in these fine pores adds materially to the corrosion resistance of surface so treated. The amount of chromic acid to be found in the anodic films will vary somewhat with the pore size and has been estimated by C. Aribault as .041 mg. of CrO_3 per square meter of anodized surface.

Maintenance and Control of Anodizing Solution

After a period of use, any chromic acid solution ceases to function after the current density has gradually dropped to a value of about .9 amperes per square foot and additions of acid are necessary to obtain satisfactory operation. Much study has been made of the causes that result in the depletion of the solution's activity. Most authors have concluded that the formation of aluminum dichromate and the reduction of the chromium to the trivalent state are responsible, and various methods of maintaining a uniform condition of operation have been suggested.

An opportunity to study the changes taking place in the anodic bath in operation at the Lockheed Aircraft Corporation afforded a large quantity of data that was carefully tabulated and studied with some rather unexpected results. First of all, almost no trivalent chromium was found whenever the strength of acid was adjusted so that a current density of approximately one ampere per square foot could be maintained.

If the acid content was high, a small tendency to form trivalent chromium was evident but that small quantity would be rapidly oxidized again as the acid activity was reduced. In other words, trivalent chromium was not ordinarily present. Whenever new boards were

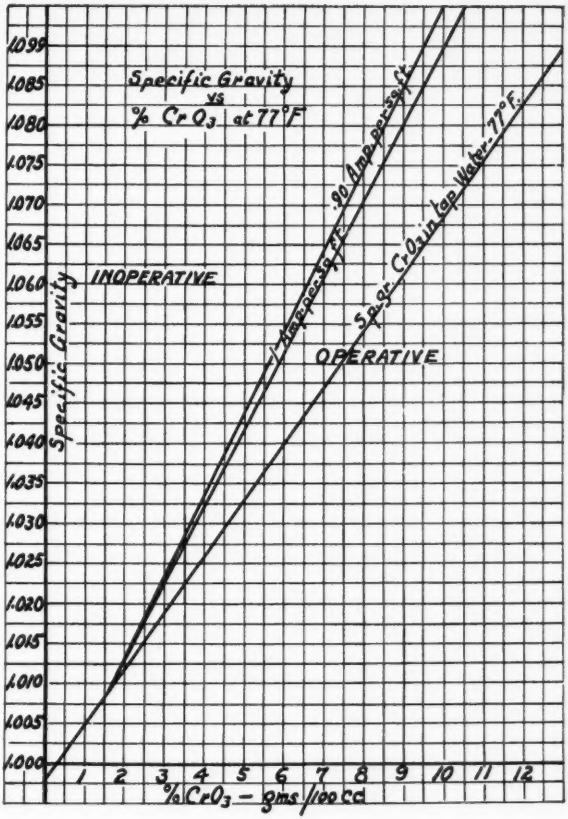

Fig. 4—A graphic picture of the study which was made of the differences between fresh solutions of various acid content and baths that contained the same total chromium but in the used condition.

•

added to the lining of the tank, the presence of organic compounds always resulted in some trivalent chromium which did not revert to the hexavalent state but seemed permanently out of action.

An attempt to correlate the percentage of aluminum did not check the results of a Bureau of Standards Report* in which failure of the bath was explained in terms of the presence of aluminum compounds. As far as can be learned, no detailed study has ever been made of all the various possible combinations of the normal and basic salts of aluminum which are possible in an anodic solution but an attempt has been made to show that the presence of free chromic acid may be judged by the pH of the solution. Any relation between the percentage of free chromic acid and the operating condition of an anodic bath does not exist in the author's opinion, since the pH of a solution controlled so as to maintain the current density at one ampere per square foot will, after the first few days, be a value above 2. Since a pH of 2 is supposed to indicate zero percentage of free acid, it is evident that free acid is not necessary, and good results are possible in a complex electrolyte composed of the various compounds formed in the anodizing bath. In fact, calculations based on the proposed formula:

$$\frac{\%\,Cr^{VI} - (5.8 \times \%\ Al + 3 \times \%Cr^{III})}{.52}$$

actually gave negative answers for the free chromic acid and so confirmed the conclusions drawn from the pH values. After the anodizing bath has been in use for some time, the values calculated from the above

*Research Paper RP961, "Deterioration of Chromic Acid Baths Used for Anodic Oxidation of Aluminum Alloys" by R. W. Buzzard and J. H. Wilson.

The International

DEFENSE *and the* **FUTURE . . . .**

Copy of Letter to users of Products of The International Nickel Company, Inc.

Nickel Company, Inc.

67 WALL STREET
NEW YORK, N. Y.

April 17, 1941

Dear Sir:

Our plants, in common with those of most of America's industrial units, are working at their peak on defense production. In spite of this, hardship is being inflicted upon many consumers of our products who in the past have aided us in building a great business, and upon whom we must depend for our future success.

As this letter is written the monthly production rate of The International Nickel Company of Canada, Limited is already 20% above last year; three times that of 1929 and four times the peak rate of the last war. Its facilities have been increased to supply current defense demand and further increase in output will be available this year.

Upon the conclusion of this devastating war the future success of your business and ours will depend in large measure upon the retention of the good will of our customers. Any effort we can make, not conflicting with our full support of the defense program, should be directed toward this vitally important objective.

To this end we wish to offer our services especially to those customers whose requirements cannot for the moment be filled. One practical means of rendering such service is to offer you the assistance of our technical staff in solving problems of material arising from the temporary lack of nickel.

Our problems are complex and constantly changing and can only be solved through cooperation. As we see it, a large part of the solution lies in making clear the situation which we face. Your help and advice will be of invaluable assistance. It is our purpose to follow this letter with a personal call from one of our representatives, if you so desire, who will discuss with you in more specific detail our mutual problems.

Yours very truly,

PRESIDENT.

formula will average from —1.50 per cent to —1.65 per cent of CrO_3, or in other words, it would take about 1.5 per cent of pure CrO_3 to restore the bath to "zero free acid content."

and settling is very noticeable at that time if the activity of the bath is such that the 1 ampere per square foot is still maintained. At about this point, extra acid additions are

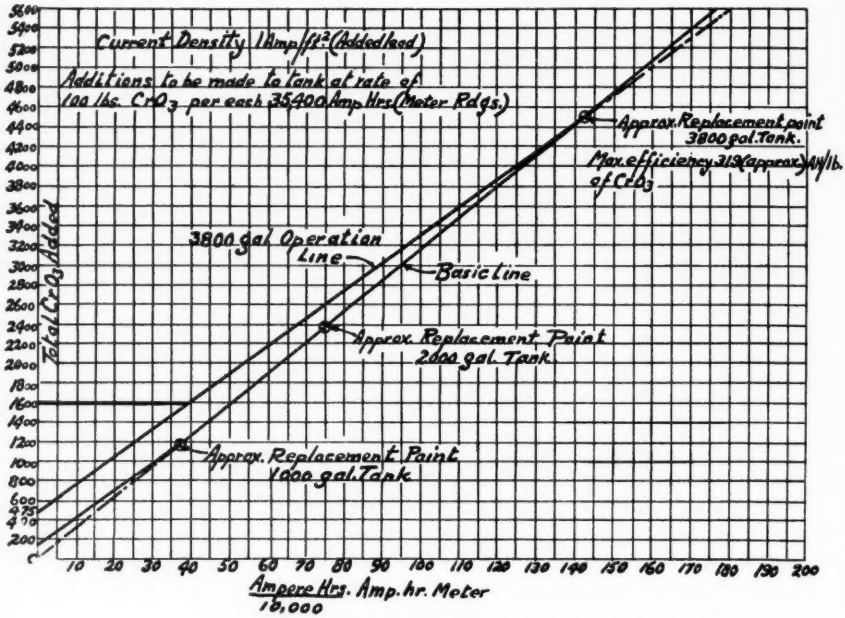

Fig. 5—The curve on this graph is the result of keeping an exact control of all acid additions for several months and plotting the use obtained from each addition against the acid added.

Probably there is a definite relation between the amount of hexavalent chromium, the pH and the content of aluminum in regard to the condition of the solution but the complexity of their relationship has not been completely explained so far. The presence of the colloidal double dichromates of aluminum and chromium have not been found in the solutions studied at Lockheed as is shown by the absence of trivalent chromium but some colloidal material does become evident when the concentration of total chromium is about 7.5 per cent expressed as CrO_3.

necessary to again form normal salts and to prevent loss of activity of the solution. This, of course, is not economical if carried too far and usually the point of maximum efficiency will be shortly beyond that point, usually at approximately 10 per cent CrO_3 and a new bath will be advisable.

A normal efficiency curve as followed at Lockheed Aircraft is shown in Figure 3 and, as will be noted, a normal solution may be expected to reach a maximum of 319 ampere hours of use per pound of acid, after which point a drop is usually ob-

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served due to greater dragout losses at the higher concentrations and the abnormal consumption of acid needed to maintain satisfactory operating conditions. This curve has been calculated mathematically and plotted together with actual operations curves for several baths covering the operations of a 4,000 gallon installation and the resulting Figure 3 is now used as the ideal upon which to base shop control.

Several attempts have been made in the past to find some easy method of keeping the anodic solution at a constant activity and consisted of pH control, specific gravity versus per cent chromium, conductivity measurements. Some success has been attained in each case, but the former requirement that at least 5 per cent acid be present prohibited any attempt to begin at low acid concentrations and to make acid additions in such manner as to keep a constant current density during the whole life of the solution. Due to the fact that Lockheed was not working on Government contracts at that time, a complete investigation of the various methods of control was possible.

Several factors led to the decision that operating below 5 per cent acid was desirable. Among these may be mentioned: ability to carry loads of large area without increasing generator capacity, reduced acid consumption, uniformity of results, the advent of the idea that a thin nonporous film for paint adhesion was as satisfactory as the time-honored heavy gray coating, and the observation that it was actually more difficult to remove the thin film by stripping agents than to remove the heavy type films. In fact, a French delegate had reported to the Royal Aeronautical Society some two years ago that his experiments showed the thin denser films to be much superior in service. The very general use of the inhibiting type primers in addition to the anodic coatings insured satisfactory service life even for the thinnest protective films. In fact, such thin films will pass the 720 hour saltspray tests without difficulty and will satisfy the corrosion requirements of the Government specifications as they now exist.

Since the 720 hour test represents only a small portion of the service life normally expected from an airplane, it is obvious that the anodic coating is to be considered as a means toward obtaining protection rather than as the protection itself. Keeping an exact control of all acid additions for several months, and plotting the use obtained from each addition against the acid added, resulted in the curve shown in Figure 5. This was found to be quite consistent for the life of several solutions, and from this it was evident that starting the bath at an acid concentration far above the curve for the initial operation and then following the slope of the curve for the remainder of the life of the bath, is a rather unscientific procedure to say the least.

Since the present British method of control is based upon the change in specific gravity during the operating life of the solution, a study was made of the differences between fresh solutions of various acid contents and the baths that contained the same total chromium but in the used condition. A graphic picture of these values is give in Figure 4, and the determination of satisfactory solution conditions can be very easily and definitely established by reference to the curves. It will be further noted that the line of specific gravity of the pure acid crosses the line of operation at about 1.5 per cent CrO_3, and this is the lowest percentage of

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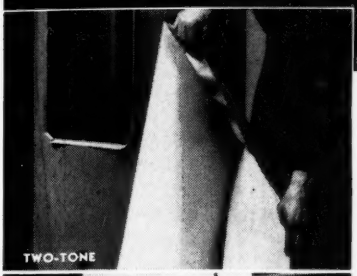

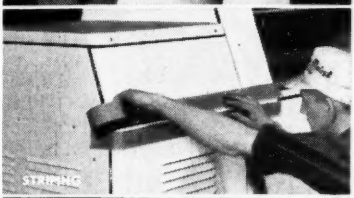

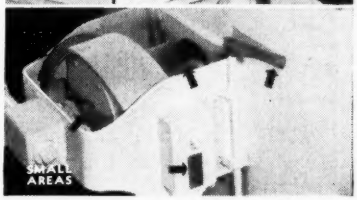

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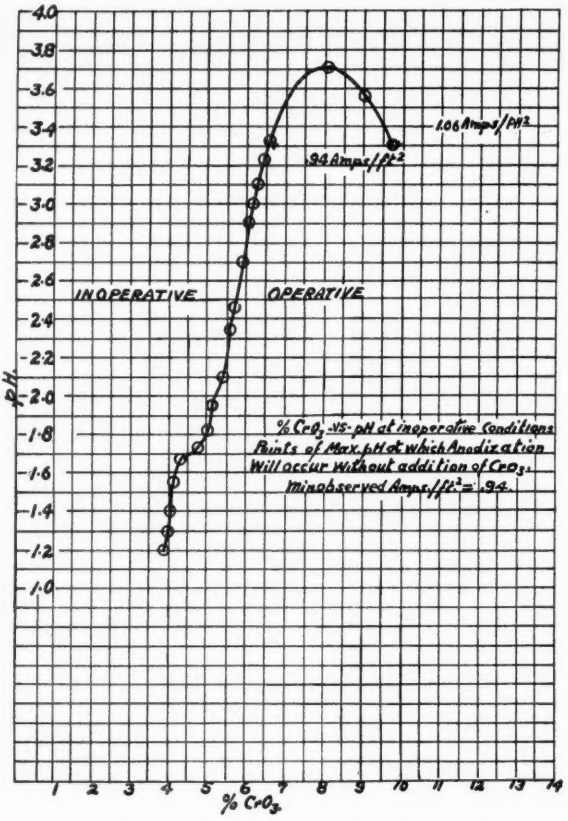

Fig. 6—This curve shows the result of graphing pH against acid content at points of equal current density.

acid at which good results (one ampere per square foot) are obtainable if we are to maintain the same level of conductivity throughout the life of a solution.

Assuming this minimum point and using it to establish the low point or beginning point of the basic line in Figure 5, we have only to continue the line through the point at which the maximum efficiency of the bath was found and so produce the Basic Line itself as shown in Figure 5. The British method of adding acid as needed until the specific gravity reaches 1.058 or Baume 8 deg. and then replacing the solution would not result in reaching the efficiency obtainable by carrying the additions of acid much farther. In fact, very good results have been obtained at specific gravity of 1.080 and the need for a new solution is believed to be a matter of acid efficiency and economy and not determinable by specific gravity readings only.

Graphing pH against acid content at points of equal current density values resulted in the curve shown in Fig. 6, but attempts to reproduce the results with other solutions have failed; and in the author's opinion, the use of pH values for either control or indication of the necessity for changing the solution is unreliable and uneconomical.

After consideration of the above results of a study to determine a reliable method of control, the use of the operation line shown in Figure 3 was considered to be the more easily applied in actual shop practice; and after following this method for a period of approximately one year throughout the lives of several solutions we have firmly established the accuracy of the method. For a 3800 gallon tank, an initial concentration

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of 1.83 per cent of CrO_3 is used, and since 100 pound additions are made as a matter of convenience, acid is added after each 35,400 ampere hours of use. For smaller units, lines parallel to the line shown in Figure 3 may be drawn and used as control curves. In such cases the anodizing solution will reach its maximum efficiency and require replacement at correspondingly lower total ampere hours of operation.

Dragout Losses

All of the curves which have been discussed so far have disregarded the loss of acid by dragout. It has been found that the loss by dragout will be approximately 28 to 30 per cent of all the acid added during the entire life of the solution provided the concentration has been maintained according to the operations curve shown in Figure 5. In general, higher dragout losses will be incurred at the lower current densities due to the greater surfaces anodized per pound of acid.

Operating Costs

The consumption of acid based upon the method of control proposed above will be approximately 2.2 pounds per 1000 square feet of surface anodized. By surface anodized is meant the total area of all the exposed faces, or in the case of sheet work both sides are counted. At the present price of chromic acid this will mean an expense of $0.44 approximately for 1000 square feet of surface anodized.

During the process of anodizing 1000 square feet of surface, approximately 30 kilowatt hours of electricity are consumed. The cost of current will, of course, depend upon the power rate. As an example, at $0.02 per kilowatt hour would indicate an expenditure of $0.60 for electricity for 1000 square feet of anodized area.

Summary and Conclusions

The foregoing discussion is based on anodizing aluminum and aluminum alloys for surface preparation prior to application of paint coatings and much larger current densities may be desired for other purposes. In fact, thick films are often used for insulating electric condensers, for resisting abrasion, for absorbing dyes or other coloring matter for ornamental uses, or for changing the heat or light absorbing or radiating properties of the surfaces. In all such cases, solutions may be maintained for a few weeks at the desired current densities for producing the desired properties of the oxide coating and then operation curves can easily be established for acid control similar to those given in this paper based on a lower value of current density. It is believed that the method as outlined can be made quite flexible and curves can be very well established to fit any desired condition.

In conclusion, it should be kept in mind that there is still much room for further study in matters concerning solution breakdown and shop methods of control, methods of recovering the chromium from the aluminum compounds, removal of aluminum, and other factors entering into the operation of a chromic acid anodizing bath, but the following brief summary is offered as a practical solution of acid control that can be easily established as a shop practice.

1. Start a new chromic acid anodizing solution with 1.50 grams per 100 cc. (2 oz. per 1 gal.) of CrO_3 in tap water plus whatever quantity of acid you may decide as the most

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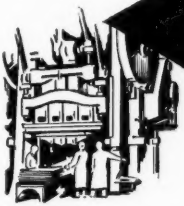

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convenient quantity for regular additions.

As an example, we add 475 pounds plus 100 pounds or a total of 575 pounds of acid to start a new bath. This gives a concentration of 1.83 grams per 100 cc. (2.45 oz. per 1 gal.) in a 3800 gallon tank.

2. Add acid at the rate of 100 pounds for each 35,400 ampere hours of use as measured by an ampere hour meter. Smaller additions may be made as desired just so the same ratio of acid to current used is maintained. This will keep the conductivity of the solution such that the current density will approximate one ampere per square foot of aluminum surface and a slightly higher current density for the various alloys.

3. When the acid has reached the concentration of approximately 10 to 11 grams per 100 cc. of total chromium calculated as CrO_3, the solution should be dumped and a fresh one started. This point is not critical but continuation of the bath beyond this value will not result in any gain in use per pound of acid and a slight drop in efficiency of the bath expressed in ampere hours per pound of acid will follow. This drop is not abrupt and temporary shortage of material for beginning a new bath is thus not a matter for great concern. A solution may be kept a reasonable additional period of operation if necessary.

For those not having an ampere hour meter available it is an easy matter to set up a control curve based on a figure obtained by adding the amperages drawn by the individual loads of parts being anodized. The readings should be taken toward the end of the cycle after the amperage has become fairly steady. When the sum of the amperages has reached the required figure, additions of acid should be made. Due to the high amperages during the initial application of current, it is not correct to assume that a ratio of $\frac{32.5}{60}$ can be used to calculate the ampere hours for determination of acid requirements. Experiments and records covering a considerable period of time show that the values are slightly different when running heavy loads from those found from the readings taken during light loads. However, for all practical purposes one may assume Amperage Sum x .75 = Amperage Hours by meter readings, and the control curves may be established on this basis. When such summations are used it will be found that acid should be added at the rate of 100 pounds for each 47,200 added amperes. Operations at Lockheed have been successfully conducted using both the additative and the meter methods with equally satisfactory results.

The Facts About Infra-Red. What is said to be the first brochure published on the subject of infra-red finishes is being distributed by Ault & Wiborg Corporation, 75 Varick St., New York City, to manufacturers interested in the possibilities which infra-red finishing provides.

The booklet, called "The Facts About Infra-Red," includes a reprint of a magazine article by M. M. Wilson, describing the application of finishes to infra-red operations and the places where infra-red has proved practical and impractical as a finishing method.

Also included is a series of questions and answers on infra-red finishing problems. The brochure is available to manufacturers who write to the company.

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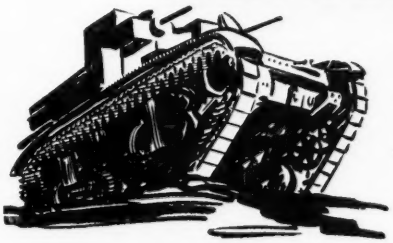

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Finishing the General Electric Oil Furnace

Presenting some of the more interesting operations in the finishing of a modern domestic heating plant.

By J. T. SCHAEFER

AMONG the conveniences which are characteristic of our modern civilization is the ability to heat the modern home by the use of fuel which can be fed to a furnace through a pipe, regulated by means of a button on the wall, and which does not necessitate the task of removing ashes — in other words, the oil burning furnace.

Oil in the semi-refined state in which it is used as fuel is a highly efficient medium of obtaining heat especially in comparison with the cruder form of fuel. However, the efficiency available through the use of oil as fuel depends to a large extent upon the efficiency of the heating unit in which it is used. Oil must be fed to the furnace in exact amounts properly atomized, and the furnace itself must be engineered to make possible the most

Fig. 1—Cutting oils, greases and other foreign material is removed from the small parts by means of the solutions which are contained in the tanks located in the department shown here.

Fig. 2—This illustration shows a general view of the cadmium plating department.

efficient application of the heat obtained from the oil. Such technique, in turn, depends upon a thorough knowledge of combustion engineering and of the mechanics by which a furnace so designed may be constructed.

In addition to the efficient design and construction, the furnace must necessarily be finished so that it will fit in with the furnishings of the modern home. The operations involved in the finishing of the modern oil burning furnace are particularly interesting, so much so in fact, that a number of these operations have been selected to for the basis of the description which follows herewith.

Among the better known oil furnaces on the American market are those built and finished by the General Electric Company, Schenectady, New York. These oil furnaces are constructed of a large number of small cast parts and stampings, many of which must be cadmium plated before being placed in the final assembly. After all manufacturing operations have been completed on the parts, they are placed in tote pans and delivered to the cleaning department shown in Fig. 1. By arranging the tanks shown at the left of this illustration in the order in which they are to be used, unnecessary handling is eliminated, time is saved, and the parts are more thoroughly processed.

The parts, after being placed in wire baskets or fastened to racks, are placed in the electrolytic clean-

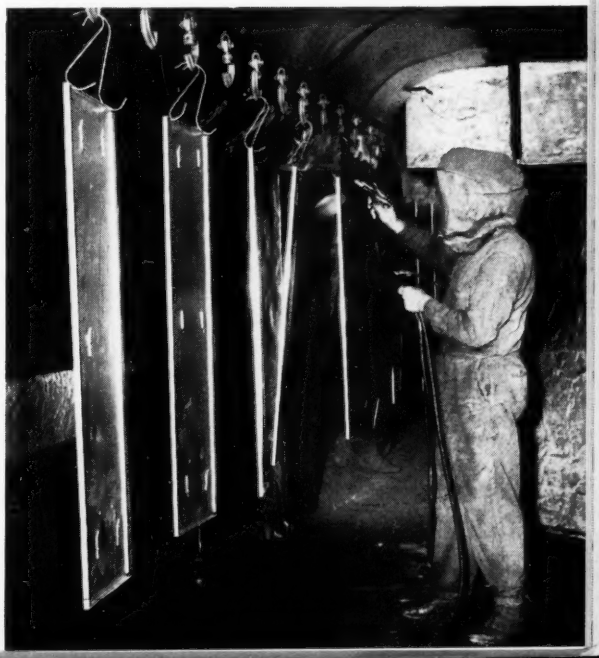

Fig. 3 — Cabinet panels are sprayed with black enamel by the spray operator shown here.

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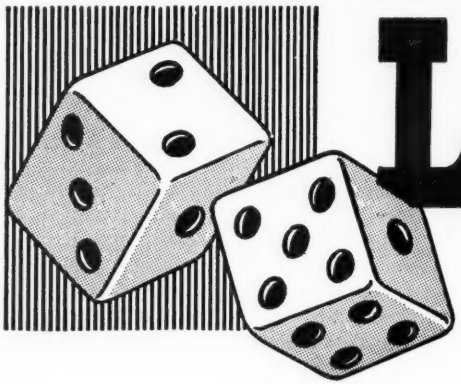

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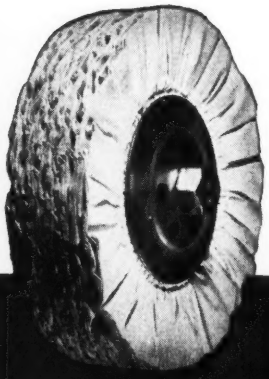

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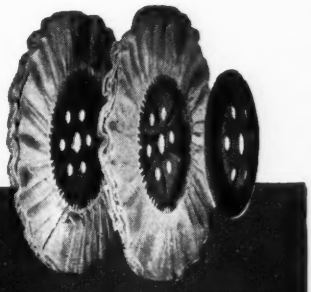

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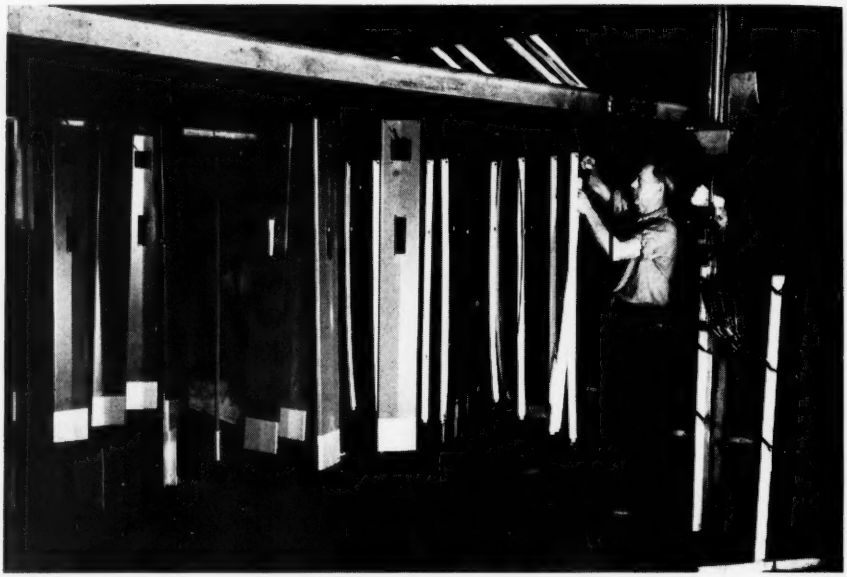


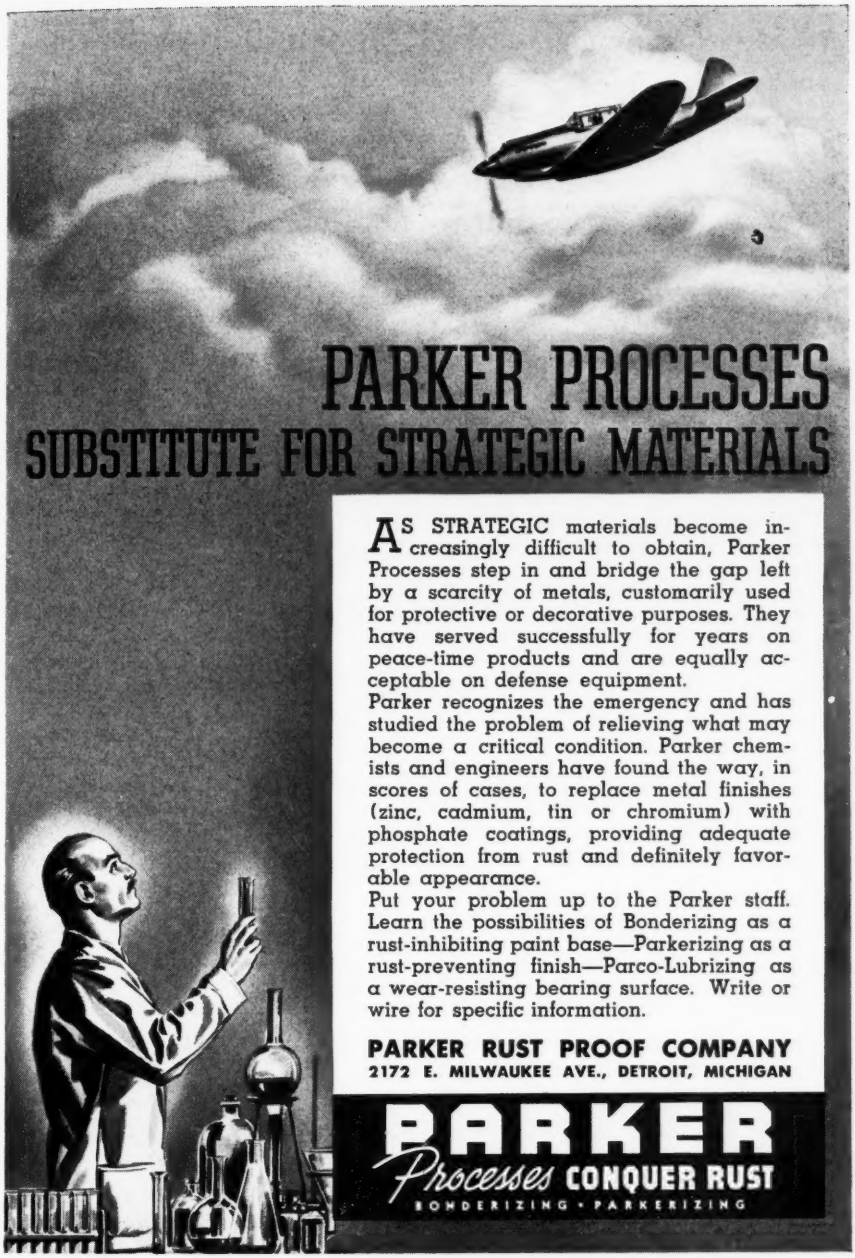
Fig. 4—This illustration shows the entrance end of the baking oven in which the panels are baked for one hour.

ing bath shown in the foreground. Oil, grease, filings, and other contamination is removed in this bath. The parts are rinsed in a tank located adjacent and are then placed in an acid bath. Another rinse, followed by a neutralizing solution and a final rinse completes the cleaning cycle. The final water rinse is maintained at a relatively high temperature, consequently the parts dry off very quickly after they are removed from the tank. A stream of warm, dry air which is directed against the parts after removal from the warm water rinse assures the complete removal of any excess moisture.

Following the cleaning operation, the parts are transferred to the cadmium plating department shown in Fig. 2. The cadmium plate provides many of the parts of the G-E oil burning furnace with a rust resistant coating. In addition, many of the parts are especially adaptable to mass finishing by the barrel method. The fact that the cadmium bath has good throwing power is particularly important due to the many intricately machined and formed parts are used in the construction of the G-E oil furnace.

The small parts to be plated are placed in a barrel of the type shown in the foreground of Fig. 2. This barrel is conveyed from one tank to the next by means of an overhead monorail conveying unit. After plating, the parts are removed from the barrel, placed in small tote boxes, and conveyed to the assembly departments.

In the marketing of a household product such as the modern oil burning furnace, the factor appearance plays an important role. Thus, we find that special emphasis is placed



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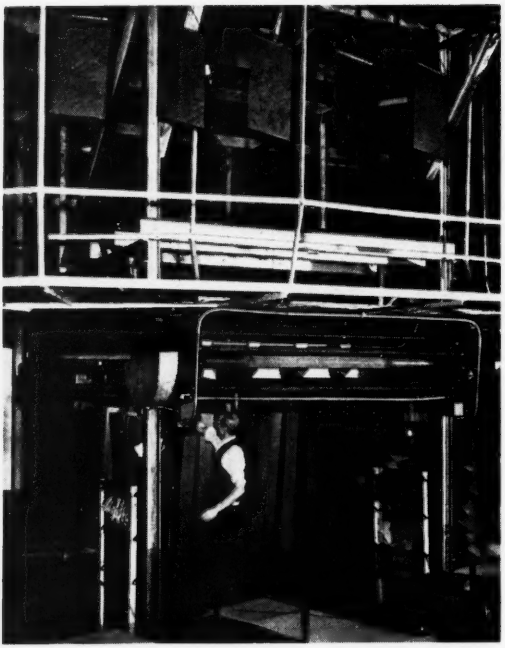

Fig. 5—A view of the exit end of the baking oven showing the operator removing panels from the horizontal bars of the oven conveyor.

on the appearance of the G-E units. The cabinets which house the units are constructed of pressed steel panels. These panels, after forming, punching, and any other fabrication operation, are subjected to a degreasing spray to assure good adherence of the finishing material which is applied on them. Following degreasing, the panels are placed on a conveyor which carries them into the spray booth shown in the illustration Fig. 3, where they are sprayed with enamel. The overhead conveyor shown in the illustration carries the panels from one operation to the next. The operator is wearing a newly developed hood which is said to assure complete protection from paint spray or fumes. Explosion-proof lamps are used to provide an abundance of illumination. This feature is desirable due to the darkness of the finish being applied.

After a coating of black finishing material has been applied to one side of the panel the conveyor carries it to another booth located adjacent to the first booth, at which point the opposite side is sprayed with a light colored material. When both sides of the panels have been coated, the panels move to the baking oven, a view of which is shown in Fig. 4. Here, the panels are hung on a horizontal bar type conveyor which carries them through the oven. The baking interval requires approximately one hour to assure a first-class finish, both in durability and appearance. Following the baking operation, the panels move to the exit end of the oven shown in Fig. 5. Here the panels are removed and placed on skids for removal to the main assembly department. Located above the exit end of the baking oven is the conveyor on which the panels are carried to the degreaser unit, from which they will emerge and enter the paint spray booths located at the opposite end.

"Quiz the Operators" is the title of a six-page, attractively printed bulletin now being issued by the Norton Company, Worcester, Mass., illustrating and describing the use of Norton Resinoid Wheels with portable grinders. The bulletin covers the features and advantages of these wheels and contains a condensed listing of some of the commonly used sizes and shapes.

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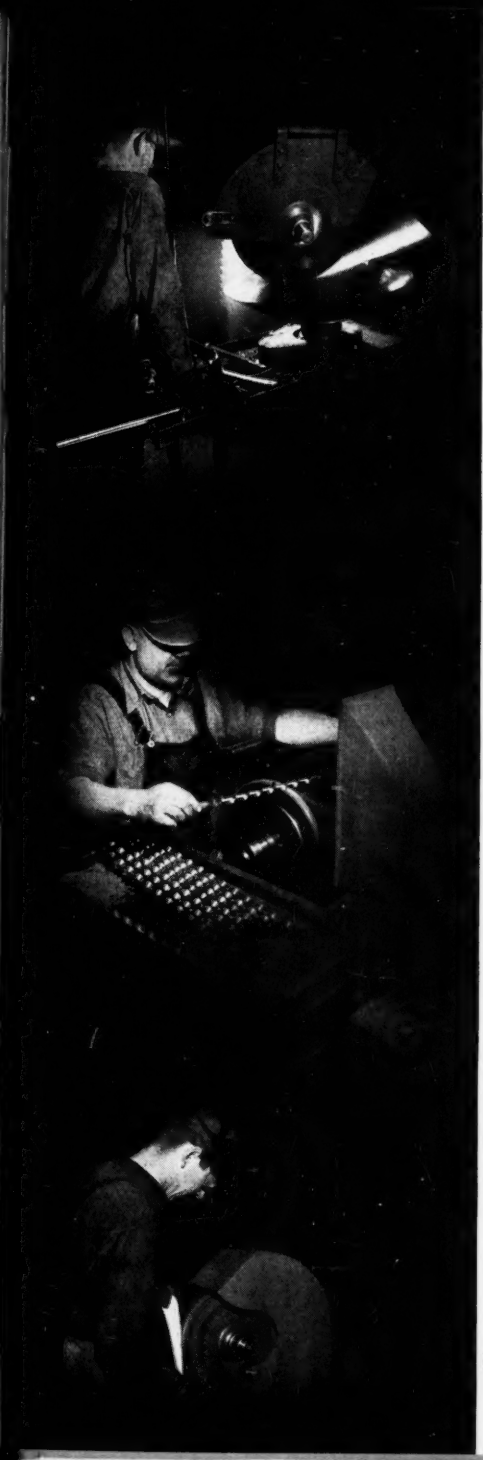

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G-116

Barrel Finishing

Continuing the Discussion of Conservation of Metals By Using Barreling Methods

By H. LEROY BEAVER

Barrel Finishing Consultant
Lansdale, Pennsylvania

IN the discussion of the preceding month the subject was, in the main, pointed toward a method for the conservation of metals used in plating procedure and suggesting the manner in which this could be accomplished in large part by a proper understanding of the essential results that might be obtained by barrel finishing operations on a widely diversified line of metal parts.

In recent weeks, the tone of the National picture has changed and industry is now pointing to predicted shortages in the case of many of the metals that we regularly were accustomed to use when "business as usual" was the rule. Aluminum, zinc and steel are apparently the present spots for worry, and the question of what might be adopted as a substitute for these metals in the fabrication of products are not in truth and in fact the true essentials contemplated in production for National Defense.

That these shortages in essential metals are very real and not merely children of a panicky industrial complex, is amply borne out in the remarks of the writer's very good friend of many years standing, Mr. W. L. Batt, President of SKF Industries and Deputy Director of the Office of Production Management, who in speaking recently to a group of Wharton School Students of the University of Pennsylvania in Irvine Auditorium said, and I quote:

> "Besides, there will be a tremendous increase in the use of substitutes, especially for metals"

and further in the course of his remarks he went on to say that, "the biggest defense shortage today is not in raw materials, but in **"good industrial management."**

It seems to us that shortage of essential metals and good industrial management go so closely together hand in hand, that it would be the part of good industrial management now using essential metals to immediately cast about for some suitable material that might be substituted for such metals and yet be entirely satisfactory for production of the products wherein metals were previously used. This, of course, points directly to our now fastest growing infant industry and that is plastics.

# of Metal Products

What we wish to discuss now is the relation of barrel finishing in the production of parts from plastic materials and which might be used in conservation of metals needed more urgently for our multitudinous defense production.

While we have previously discussed some one phase or another of the finishing of plastic parts in barrels, perhaps it would be appropriate to review briefly some of these essentials at this time. Plastics are of many kinds, and most of them are applicable for substitution for many products now completely formed from metals. In forming rough blanks, far greater latitude can be used than in the production of metal parts, because these materials may be blanked, formed, moulded, sliced, turned, tapped and drilled far easier and quicker than metals, and barreling operations are just as applicable in the finishing of plastics in mass production as they are in the finishing of metals. While the underlying principles are almost identical, the procedure and materials used are, of course different, as we shall point out later.

Many manufacturers to whom we have talked have expressed a willingness to try substitution of plastic materials for metals, but almost invariably their objection is that their trade is accustomed to metal or at least the appearance of metal and that plastics with their vivid colorings would in many cases look pretty much bizarre and out of place. Then comes the very natural question—"Can plastics be plated and polished so that they will look like metal and take the place of metal parts?"

The answer to this of course is "YES," and it is now being done very successfully. There are several methods that have been developed that are functioning satisfactorily in the metallizing of plastics prior to plating and final finishing, and barreling operations may enter into all of these processes from the very beginning.

Just as in the plating of base metal parts, we have two schools of thought, one believing that the surface of parts to be plated should be somewhat roughened to provide for a better bond between the base material and the plate to be applied and the other contending that the parts should be as smooth as possible prior to any treatment whatever. Insofar as barrel finishing is concerned, it can be accommodated to either a condition of a somewhat roughened surface for preliminary metallizing prior to plating and then from the rough surface we can produce finishes in varying degree down to a highly polished and burnished surface on which to deposit the first or metallizing coat on which the plate is later deposited.

We do not pretend to judge which of the two theories is the correct one, but if our experience in the barrel treatment of metals prior to plating is equally applicable in the treatment

of plastic parts to be plated, then we would lean very strongly toward the very smooth surface prior to metallizing for the same reason that we do in metals, and that is, the greater ease in the final finishing of the part, after the desired metal has been electrodeposited on the metallized surface of the plastic part.

With an eminent shortage of many of the metals now used in non-essential industries all too apparent, we have had many inquiries both from manufacturers and electro platers concerning plastics, and especially so from those manufacturers and platers who are already using barrel methods for the finishing of their parts. These questions for the most part ask whether plastics can be successfully plated — can any kind of plastic material be used—is the operation a complicated one—does it require a lot of additional equipment—is it expensive—what kind of plastic is the best to use where the parts are to be plated — and would we briefly describe the steps necessary in the plating procedure? To catalog these and many more questions relating to the insulating properties of plastics, their toughness, brittleness and many other properties, would be impossible in a series of this kind.

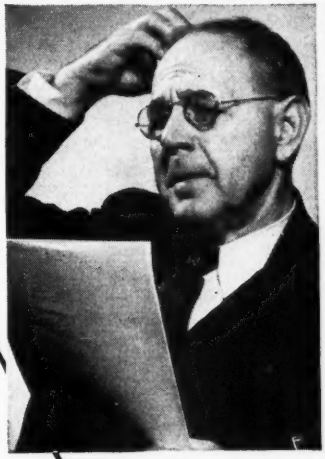
Answering the questions in the main, we can say that the processes developed thus far are more applicable to those plastic materials that could be described as impervious, because if they were porous to any considerable degree they would first have to be treated with some pore closing material prior to the metallizing process. Then too, it is important that the plastic is one that will not disintegrate in the plating bath while in process. The operation is not an especially complicated one, and it can be easily mastered by anyone familiar with plating procedure and familiar with the handling of regular plating equipment.

Plastics may be racked for plating when necessary or where applicable they may be barrel plated in the same way as metal parts are plated, with a few differences which we will note as we go along. The cost of such equipment necessary for the carrying out of the process is not very great as far as plating plants are concerned and requires very little equipment of a special nature.

The metal deposited in what is understood as the first metallizing is, of course, silver and one school of thought recommends the preliminary roughing of the surface of the parts either by a sand blasting or some other roughening method. If this is desired it may be secured by a barreling operation. Another school of thought contends that the surface of the parts should be as smooth as possible in order to cut down polishing time in the final finishing operation. Then too, methods of precipitation of the silver coating vary, one wanting only so much silver on the surface that it conducts and stay bright while the other insists upon a complete precipitation of all the silver on the parts, which we can understand might result in a somewhat rough grained surface structure, as compared with a smooth mirror-like effect. Naturally, if the surface of the deposit is grainy and the later deposition of metal is made on this grainy surface, it will require either more buffing or longer barrel finishing cycles to produce an even surface.

Naturally, we cannot describe in detail all of the various methods recommended for the metallizing of plastic parts prior to plating, for

Puzzled ? ? ? by a finishing problem?



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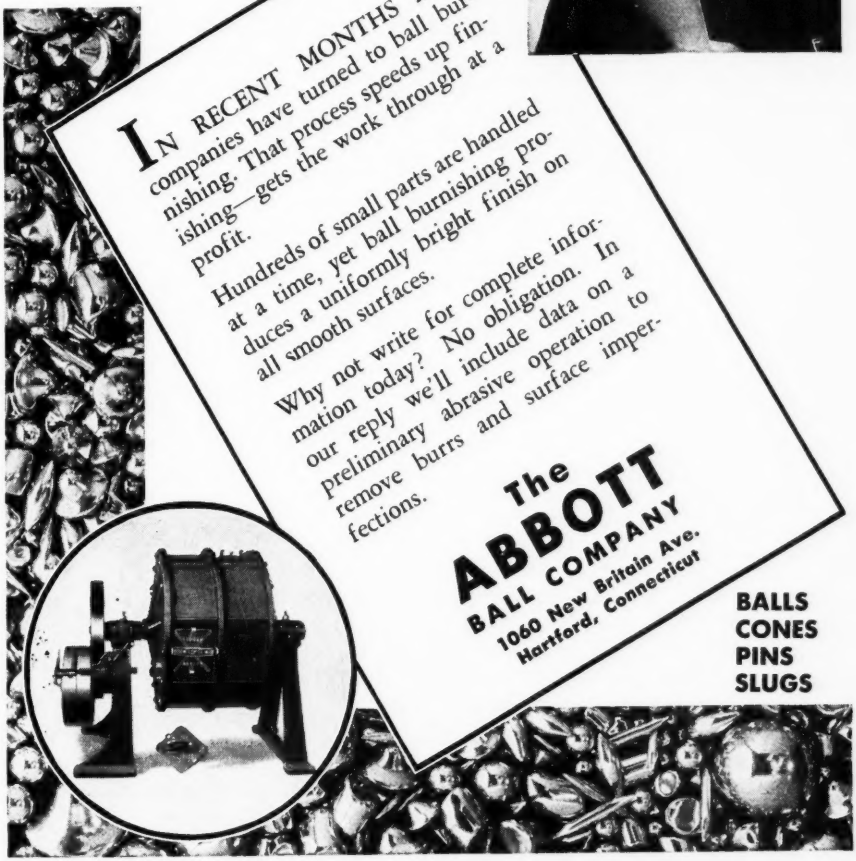

BALLS
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space would not permit, but in order to give our readers some idea of a typical process, that is widely and favorably regarded, we will give a brief description of such a process and the one with which we are the most familiar. Since this is apparently a process that will excite considerable curiosity, we will undertake to describe and compare other processes in later papers, and especially so with respect to their applicability to barrel finishing procedure, which, after all, is the purpose of this entire series.

All currently developed processes have very minute operating instructions which should be followed as closely to the letter as possible. The solutions for the most part are critical in their reactions, but some latitude is allowed in their operation.

The steps involved in metallizing on waterproof plastics would be, preferably, as follows:

1. Degreasing.
2. Cleaning.
3. Sensitizing.
4. Precipitating conducting coat.
5. Build-up of copper base.
6. Finishing.
7. Coloring.
8. Lacquering, if necessary.

USE SMOOTH PORCELAIN DIPPING BASKETS OR COPPER COATED DIPPING BASKETS.

Briefly described, the operations numbered as above would be somewhat as follows:

1. Degreasing

It is necessary that superficial grease be removed by such solvents as carbon tetrachloride or trichlorethylene, and so on. Air Dry.

2. Cleaning

Use 2 per cent Potasium Hydroxide (KOH) or some good industrial platers cleaner. Be sure that the solution is not over 110 deg. F. otherwise the plastic will be deformed. It is preferable that this cleaning be done at room temperature. Rinse work well in water.

3. Sensitizing

Three solutions are used in the process which we will designate as A, B and C. The sensitizing solution would be A. If this solution has not been used for some time it should be thoroughly stirred. Immerse the articles from 30 seconds to 2 minutes, using the 30 second period when the solution is freshly made and a correspondingly longer period as the solution is continued in use. The dipping basket should be kept in slight agitation during the entire immersion period. Rinse well, but not too thoroughly. The solution designated as A may be used over and over again until its action is found to be no longer effective.

4. Precipitating Conducting Coat

We come now to solutions B and C. First determine the quantity of solution B that is required and place in a proper container. Due allowance must be made in the capacity of containers to take into consideration the volume displacement of the work as well as the quantity of Solution C that will be necessary to be added. Now, without waiting for the parts to dry from Solution A, dip them into Solution B.

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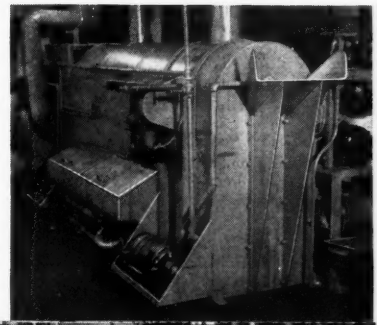
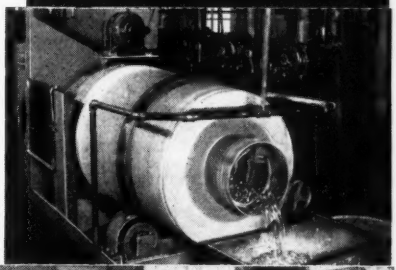
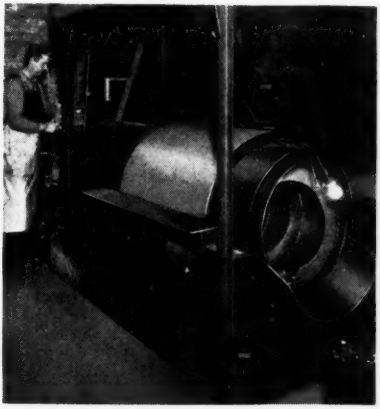
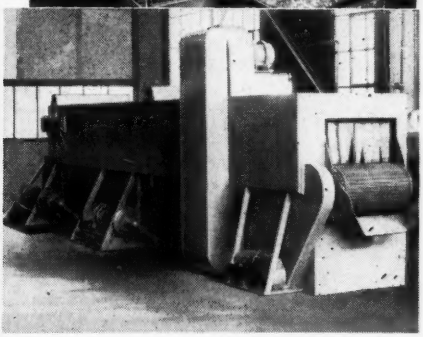








(Above) Ideal Conveyor-Type Machine for wash, rinse and dry of large parts, installed for large manufacturer of Cleveland, Ohio.

N. RANSOHOFF, INC.
Elmwood Place, Cincinnati, Ohio

Immediately mix into the metallizing tank the proper quantity of solution C, which will be 5 per cent of Solution B, with slight agitation, being careful not to strike the pieces against each other or against the sides of the container. 1½ to 2 minutes usually will give a very smooth coat. The precipitation of the solution is completed in about 10 minutes although it is preferable to remove the articles at the end of 1½ to 2 minutes.

Increasing the length of immersion time causes the metallic particles to precipitate in larger and coarser grains. The length of this operation may be determined after experience by the operator. Following this, the work should be rinsed well in water, air dried and then allowed to set for at least 15 minutes. Extreme care must be used not to bruise the coating which is very thin, and it is suggested that gloves be worn in handling the work at this stage.

Note: The mixture of solutions B and C can be used only once and must be discarded after each batch of work, and each batch of work requires an entirely new B and C solution. Solution A however, as previously noted, may be used over and over again until its action is found to be no longer workable.

5. Build-up of Copper Base

Suitably string the work on wires using cotton gloves, and immerse in an acid copper solution containing 28 ounces of copper sulphate and 3½ ounces of sulphuric acid. If the solution is used in a still tank, the plating should be done at ½ volt and not over ¾ volts if the load is great. The anodes must be bagged and the solution should be filtered from time to time.

If agitation is used, the voltage may be increased to as much as 1½ volts. With agitation, it is possible to speed up the plating time by increasing the temperature to 110 deg. F. To assure successful subsequent operations coatings of less than 0.002 in. are not recommended, and a minimum of 0.004 in. is suggested so that the parts can withstand considerable wear or abuse.

6. Finishing

It is essential that no heat be applied in finishing since we are dealing with a thin coat. If a wheel is to be used, tripoli is not recommended on the rough coating, but rather wet sand or pumice on a rag wheel. After the rough spots, if any, are removed (depending on the efficiency of the copper tank) the work can be easily finished in the normal manner, being careful however not to apply too much pressure or to create excessive heat.

(Note: At this point the discussion of barrel finishing should be considered, but space will not permit and this will be more exhaustively treated in the July Issue of PRODUCTS FINISHING.)

7. Coloring

Any approved method of coloring that does not require excessive heat or the generation of heat in the process will be satisfactory. (This will be also discussed in July with respect to barrel finishing.)

8. Lacquering

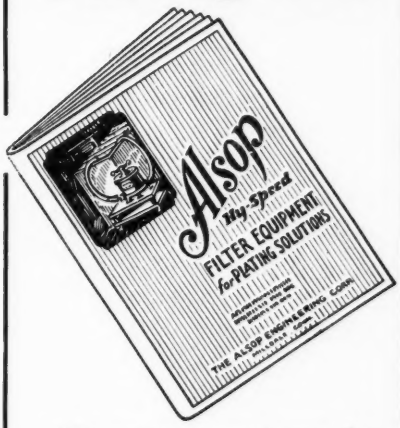
If the thickness of the coating is .002 in. or greater an ordinary cellulose nitrate lacquer can be used. On thinner coatings, because of the porosity of the plate, the base plastic will determine the type of top coating that may be used.

It is important in order not to waste solutions that solution B and C should not be mixed until it has been first determined just the proper quantity of solution that will be necessary to accommodate the quantity of parts to be covered. This is a precipitation reaction and the solution must be discarded after each batch. When solution B is added to solution C, a precipitation results, consequently the parts must have either been placed in the container holding solution B before solution C is added, or the parts must be inserted in the solution not later than one or two seconds after the solutions B and C are mixed.

While the foregoing briefly describes the successive steps used in an average metallizing process as applied to plastics when operated in a still tank, the same process somewhat modified may also be used in barrel plating procedure. We do not deem it especially important to cover this also, as the gist of our inquiries has been, as to what steps are necessary, but to any readers interested in the barrel method as contrasted to still tank method, we will supply this information on request.

The importance of barrel finishing procedure on plastics in preparation for sensitizing and plating, as well as for barrel burnishing the plated parts for final finish will, as previously noted, be discussed in the next paper.

To Do a Better Plating Job!



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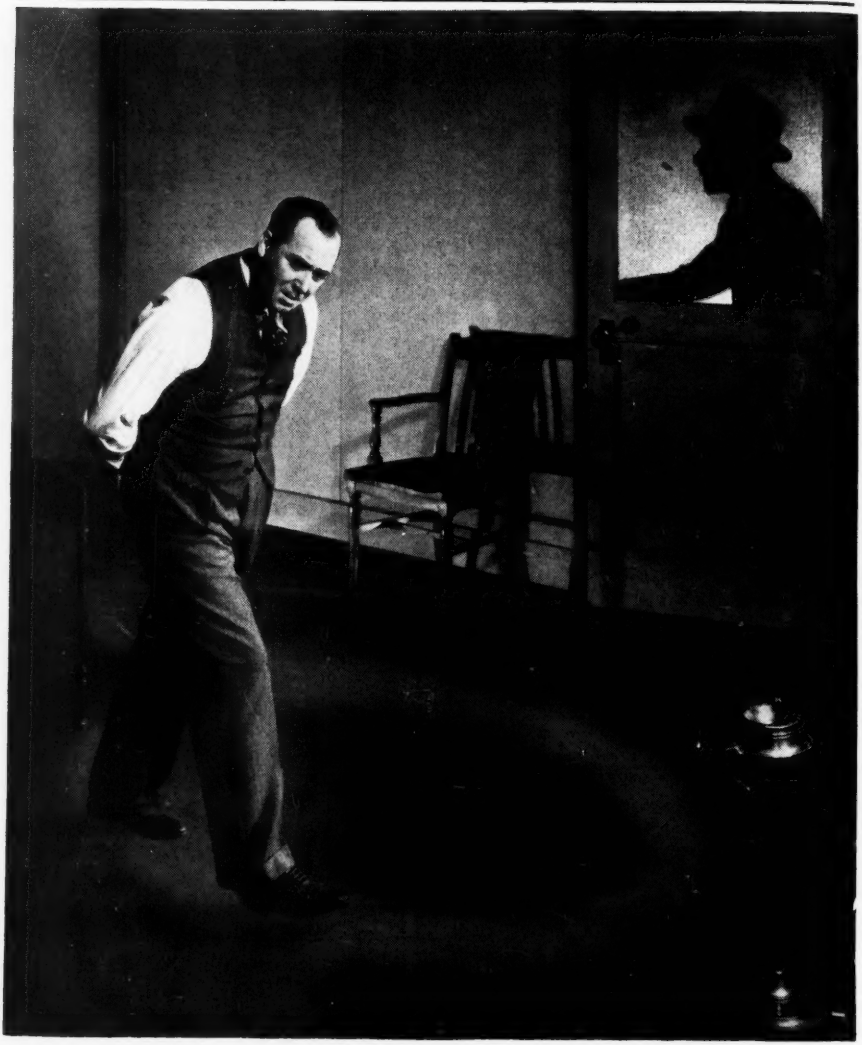

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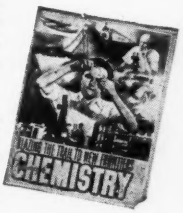

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Modern Gold Plating

By JOSEPH B. KUSHNER, CH.E.
Metal Finishing Consultant
New York City

EVERY now and then, a novelty or jewelry manufacturer becomes interested in the idea of substituting an electroplated gold finish where a rolled gold or gold filled finish was used before. He calculates that by so doing he can eliminate all the scrap waste produced in the process of cutting and stamping his work from the gold filled stock; he envisions elimination of the rolled gold or gold filled manufacturers' profit; he likes the method of first forming the work out of base metal then covering it with a smooth continuous coating of gold alloy instead of having to fabricate it from highly expensive metal and end up with the possibility of solder marks and raw edges showing through.

Of course, he knows the other side of the picture too. He knows he will have to set up a new department in his plant for doing the plating work and he also figures on the initial expense. He has usually seen some of the plating shops so he knows there isn't much to heavy gold plating. Just a couple of small pots and an operator.

If one of these manufacturers wanders into our cubicle, it is with great regret that we inform him that his picture of the situation has been misleading. He cannot expect to compete with rolled gold by using a pot and a plater. In the first place, we tell him he needs a fair amount of space for the installation and cannot expect to cramp it into a spare closet. In the second place the initial outlay while not very large, is much more than he thinks because pots and chemicals are not the only things involved; there are some mechanical, metallurgical and chemical gadgets that he hasn't figured on. And last, but not least, he cannot get just anyone to run the installation. He should have a competent plater-chemist, one who is actually trained in performing chemical and metallurgical analyses.

If the manufacturer is willing to go all the way in order to make the savings he originally envisioned and wants to know something of the whys and wherefores we tell him the story just as we tell it to you below.

The first principle in depositing heavy layers of gold to a definite quality, often referred to as plating to carat or gold encasing, is to employ a gold plating bath that will

In This Article, the Author Discusses the Very Interesting Subject of Gold Encasing

Part 10

deposit a smooth, adherent deposit of gold regardless of thickness of metal plated. The importance of proper adherence is obvious, while smoothness of deposit is important for if the plate becomes too rough after a certain limiting thickness of metal is reached, a larger amount of gold will have to be polished or buffed off and this is a waste of not only gold but labor time as well.

The ideal situation, of course, would be to have a plating bath that deposits bright gold. In this case, little or no polishing labor would be required and no gold would be lost in heavy polishing. Unfortunately, at this stage of the game, no real bright plating bath for gold has been advanced on the market. There have been some efforts made in this direction, however, especially in Germany, where Dr. Max Schlotter has a patent on bright gold plating involving the use of "lyophilic" and "lyophobic" colloids. Work has been done in this connection in this country too, with brightening agents such as turkey red oil and the napthols, but to date there is nothing commercially available that compares favorably with any of the bright nickel processes, for example, in the matter of brightness and smoothness of heavy deposits.

We have seen gold plated from ordinary baths at fairly high current densities for periods up to five minutes or so and have seen them come out bright, but after that period, the deposits begin to cloud up and be-

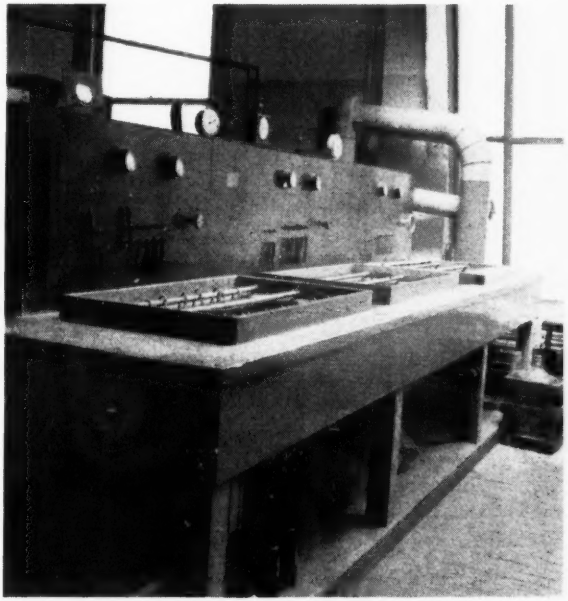


Fig. 43—A view of a scientific plating installation. Note the interval timers which are located on the top of the panel.
(Photo Courtesy Metaplast Corporation)

come matted, tending toward an almost brownish shade. If they are immersed for longer than 10 minutes, they are definitely rough as examination under a glass will show.

Often someone bobs up to tell us that so-and-so has a real bright gold plating solution; so-and-so gets real bright deposits out of his bath even with a 20 minute plate. On investigation, you find out that so-and-so is using a very low current density and the actual amount of gold he is putting on in 20 minutes of plating is considerably less than what you are putting on in five at a much higher current density. Furthermore, the deposit is not really bright but only semi-bright. Where heavy gold plating is concerned, reliance still must be had on baths that will deposit smooth, dense and adherent layers of gold at fairly high current densities.

The second principle in gold encasing is maintaining a uniform carat alloy from the plating bath. Since the plated work is intended to compete with rolled gold or gold filled material, pure gold deposits are out of the question because pure gold deposits are both too soft and too thin, in equivalent amounts.[1] It is therefore necessary to co-deposit other metals to insure adequate thickness and hardness of the gold layer. This co-deposition calls for close control and a plating bath whose plating carat can be held reasonably constant.

The third principle in gold encasing is the determination of the correct weight of gold alloy to be plated out of the bath to produce a deposit of a given quality, and the control of the rate and time of deposition so that this amount of gold is accurately deposited. This is important because if we calculate the amount of gold to be deposited on the work incorrectly and stamp it as being of a certain quality, which it is not, because of our mistake, we are legally liable under the provisions of the Gold Stamping Act. Finally, it is important because we want to put on definite amounts of gold on the work to eliminate wastage by either underplating or overplating.

Now let us take up these principles in a little greater detail.

Type of Plating Bath to Use

In choosing a plating bath for heavy gold deposition, the essential consideration is to attempt to obtain the smoothest possible deposit in the shortest possible time. Adherence is essential too, but if the work to be plated is properly cleaned and pretreated the gold deposit will stick on from almost any bath. The internal stresses in the gold deposit are very small as compared to those of chromium or nickel, for example, and so we have little to worry about on this score. The essential thing is to put the gold deposit on smooth and fast.

Almost any plating bath can be used for putting on heavy deposits of gold if the current density is kept low enough. The trouble arises because it takes a long time to do it. Thus, for instance, if we have to plate out 2 grams of pure gold on a certain piece to meet a quality specification, forgetting for the moment that we are depositing an alloy which takes more time, it will take, at the average rate of 5 amperes per sq. ft. about 3⅓ minutes, assuming 100 per cent efficiency, to deposit this much gold on a sq. foot of surface. But the object in most cases does not have an overall surface area of 1 sq. ft. Usually it is a watch case or a bracelet. If it is a wrist watch case,

[1] *See Part 5 of this series, Jan. 1941.*

Problem in Perspiration SOLVED *by* ZAPON

Pitted against perspiration, flashlight cases used to come out second best. Two hours was the limit before the best finish broke down under constant handling. So when quality-wise Winchester Repeating Arms Company turned to making their line of brass and bronze flashlights, they asked Zapon for a real perspiration resistant finish.

The answer was XL-516-EE clear finish which increased the hours of sweat resistance 45 times. But it took nine months of work and ingenuity. Since there is no adequate synthetic perspiration test we coated flashlights with the new finish and had our laboratory men carry them about their work and handle them until the finish broke down.

As a result of this research, XL-516-EE stands up for 90 hours in the constant handling test. Better yet it has served without complaint for several years in the field, on thousands of flashlights.

XL-516-EE is a clear metal lacquer, that may be hand sprayed and air-dried or applied on automatic spray machine and force dried for a short time. Besides offering a finish with valuable specific properties, its story is another saga of Zapon service.

ZAPON

ZAPON DIVISION · ATLAS POWDER COMPANY

Eastern Sales: Stamford, Conn. Western Sales: North Chicago, Ill.

INDUSTRIAL FINISHES

we can figure the area as being about 2 sq. in. or 1/72 of a sq. ft. This immediately cuts our permissible density of current down to 5/72 amp. (.0695 ampere) or else we get a burned deposit. At this rate, the plating operation will take us instead

QUALITY OF DEPOSIT: 1/20 — 12k	
K	F
17.0	.0366
17.2	.0361
17.4	.0357
17.6	.0353
17.8	.0349
18.0	.0345
18.2	.0341
18.4	.0337
18.6	.0333
18.8	.0329
19.0	.0326

Fig. 44—A sample chart giving "F" values.

of 3⅓ minutes as originally calculated, almost 4 hours. It is important therefore to use a bath that permits the use of higher current densities.

There is not much experience available and no literature to speak of the plating of gold at higher current densities but even if we hadn't done it ourselves we would have known it could be done because of Bancroft's Axiom No. 5 which says: "If a given solution gives a good deposit at one current density it will give good deposits at higher current densities provided the surface conditions at the cathode remain constant."

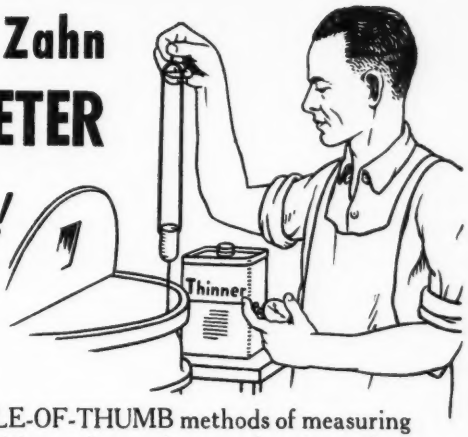
This means we should be able to plate out a smooth deposit of gold at higher current density than 5 amperes per sq. foot, the average limiting rate given by Blum and Hogaboom,[2] if we observe certain precautions. Cathode polarization should be maintained constant at a desirable point regardless of how much current you shoot into the bath and this is done by: (1) Producing relative motion between the cathode and the electrolyte or plating solution, so that gold is not depleted in the vicinity of the cathode; (2) Increasing the gold concentration so that you have plenty of gold around the cathode when the call is made for it; (3) Having something present in the cathode film to prevent it from becoming too alkaline and to restrain the growth of the gold crystals.

The first item is easily arranged for by having some sort of agitation in the plating bath. If the gold is being plated in a barrel, this automatically takes care of itself. If the gold is being plated in a tank, then a moving cathode, preferably, a circular rotating cathode set up in a circular tank, is just right. A further refinement, if the cathode is circular is to have the cathode rotate first in one direction and then in the other. This prevents too much of a gold deposit from building up on the leading edges of the work. Another variation of this which is not as satisfactory, is to have the anodes rotate in a way to cause relative motion of the electrolyte pass the cathode racks. The rate of rotation should run somewhere between 5 to 100 r.p.m., remembering that within certain limits, the faster the cathode rotates, the higher will be the permissible current density.

The second two items have to do with the solution itself; its chemical content. There are a number of plating baths available that will suit the

[2] *Blum & Hogaboom, Principles of Electroplating.*

Let the G-E Zahn VISCOSIMETER Say *When!*



RULE-OF-THUMB methods of measuring viscosities no longer have a place in modern finishing practice. A G-E Zahn viscosimeter, by giving you a definite, *accurate* measure of the viscosity of a paint mixture, will help you get a more uniform finish on your product and save costly waste of time in the spray booth. If your method involves dipping, accurate viscosity control is even more important for a uniform finish. General Electric, Schenectady, N. Y.

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Please send me data on your viscosimeter for accurate viscosity measurement.

(Material to be measured:.....)

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Company.....

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GENERAL ELECTRIC

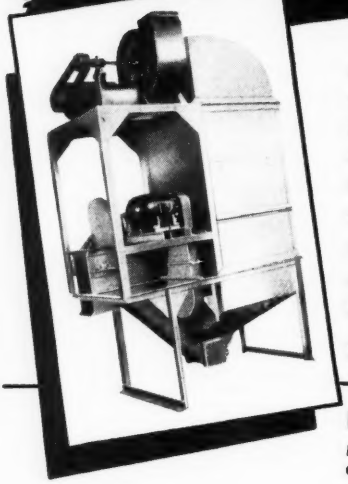
purpose more or less, some containing as many as three additional metals besides the gold, that can be used for plating at high current densities. We have one here that we believe is worthy of consideration. It is original as far as we know, since we haven't seen anything like it in the literature.

Potassium gold cyanide.2 ounces
Potassium cyanide.....2 ounces
Potassium carbonate ...2 ounces
Boric acid.....1½ ounces

The bath is made up as follows: dissolve in successive order all of the ingredients in about a half gallon of water heated to about 60 deg. C. When it is time to add the boric acid, put the solution under a hood or near good ventilation as some poisonous hydrocyanic acid is given off. Leave the solution stand for a day or two at room temperature during which time it will gradually turn dark red in color and a blackish precipitate will form. This precipitate, though it can be left in without doing much harm should be filtered off if possible. It contains a little gold, consequently, it should be saved for refining treatment. While this is going on, dissolve one ounce of nickel cyanide in just enough potassium cyanide to cause complete solution of the nickel salt. Do not put in any excess cyanide. Filter the dissolved nickel cyanide and add it to the original gold solution making the final solution up to one gallon. The bath is now ready for use.

The operating temperature of this bath can vary from room temperature to 60 deg. C. It will be found that at the higher temperature the bath is less stable as far as cyanide evolution is concerned; there will be a very slight evolution of cyanide

Buffing and Polishing Operations NOW SAFE



All lint, dust, and metal particles, resulting from buffing and polishing operations, are effectively trapped by the Hydro-Whirl—they cannot pass the efficient "water whirl". The collected dust then is easily removed from the collector as sludge by conveyor, operated automatically.

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Manufacturers of Hydro-Whirl Dust Collectors and Spray Booths, Ovens, and Parts Washers. Completely Engineered and Installed.

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even at room temperature. The quantity of hydrocyanic acid evolved is so small however, that the bath can be safely used where there is good ventilation, but the best place is under a hood. The current density permissible varies with the amount of agitation available, as well as with the temperature. With no agitation, we have plated out very fine grained semi-bright deposits of gold at current densities as high as 20 amps./sq. ft., using this bath or variations of it with and without wetting agents. With agitation, the current density can be stepped up to between 100 to 200 amps./sq. ft. It will be found that at the higher current densities the deposit tends to be too whitish, while at lower current densities it is quite yellow. A satisfactory pale yellow color is obtained at an actual carat composition of the deposit of 21 c. Below the 20 carat range the deposit is practically pure white and may be plated as white gold. The deposits will be found to be quite hard, though no comparative tests were made. If desired, other base metals can be used with or without the nickel to give varied shades and carats but the essential ingredient for plating the gold out at high current densities seems to be the boric acid.

Why the presence of boric acid should permit the use of these high current densities we do not undertake to explain, because frankly, we can't, but it is our conjecture that the boric somehow buffers the cathode film keeping the pH down in that region and therefore permitting the use of a much higher current density before the pH reaches a point where burnt deposits result. Boric acid forms complexes very readily, particularly with other weak

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acids or their salts, boroformates are a typical example, and the chances are the initial reaction that takes place is a combining of the boric acid and the cyanide or a polymer or a hydrolysis break down product. Anyway, it works.

Maintaining Bath Carat

The carat of the plating bath must be maintained at a constant value, otherwise the color of the deposit will vary and the thickness of the deposit will vary as well. To this end then, carefully calculated replenishments must be made to keep the chemical composition of the bath up to par. In the bath described above, the carat tends to slowly increase and only by replenishment of nickel and gold in the proper ratio can the carat be held at a definite, constant figure.

Allowance must be made not only for the metal that is plated on the work but for metal lost in dragout and on the wires or racks. Further allowance must be made for cyanide lost in decomposition and dragout as well as for the other ingredients. Replenishment of these metals and salts must be made at regular intervals, the principle being that of a checking account at the bank: Put in what you draw out so as to keep a constant balance. To further insure proper chemical balance, frequent analyses must be made of the plating solution.

Other incidental factors that require accurate control if carat is to be held constant are, temperature which must be thermostatically governed, and current density which must be accurately regulated to area of work plated, since both these factors greatly influence the carat of the deposit. It may seem a little complicated but it really isn't if you know how.

The final check on whether the plating carat is being held constant is made by running a pilot strip with a regular lot as frequently as is found necessary. The test piece is preferably made of a rectangular piece of silver foil. It is weighed on a balance before plating then plated with a regular lot. After the run is completed, the test piece is removed, rinsed, dipped into alcohol and dried. It is then reweighed. The difference in weight before and after, determines the actual weight of the alloy deposit. The strip is now put into boiling dilute nitric acid and the silver base is dissolved out leaving the shell of gold alloy. This shell is then subjected to chemical analysis to determine the actual gold content[3] from which the carat of the deposit is calculated.

Calculation of the Amount of Gold to Plate Out

In order that we may legally stamp a gold plated object with a carat or quality marking of a certain definite value, we have to have that amount of gold on it. The calculation of the proper amount to put on, to make a piece conform with a given quality stamp is a simple operation but it is not as simple as some think. It is surprising, but many people make mistakes in doing it.

Let us see how such mistakes can be made by a practical example. Assume that we have a bracelet weighing 100 grams that has to be plated with pure gold so that it will conform with the quality stamping 1/10—12k gold electroplate (the word electroplate must appear on the object since the passage of the new Gold Stamping Act).

---

[3] *Methods for analysis will appear in another article.*

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The finish is durable, attractive and low in cost.

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Here is one method: 1/10 of 100 is 10 grams and since the carat of the gold is 12 (50% gold) the total amount of pure gold that should be plated on the object is 5 grams.

But does this amount of gold make the piece conform with the stamping? No. The error lies in neglecting to take into account the weight of the gold. This factor must be considered in heavy gold plating. Figure it out for yourself.

After the gold has been plated on according to the calculation, the total weight of the bracelet becomes 105 grams. According to the stamp which is then put on, 1/10 of this total weight should be 12 carat gold, so 10.5 grams of the weight should be 12 carat gold, or in other words, 5.25 grams of pure gold should be on the piece. The customer has been short changed out of .25 grams of gold. Figured on another basis, the true equivalent carat of the deposit is 11.4 and not 12. The legal tolerance in cases of this kind is .5 carat. In a number of cases, deposits of this heavy weight are not required and here the approximate method of figuring is satisfactory, however, subsequent buffing may take just enough gold off, in marginal cases, to keep the work legally offside.

The correct method for computing the amount of gold to be plated out is based on the following reasoning:

Let X equal the amount of gold alloy to be plated out (weight),

K, the true carat of this gold alloy,

w, the weight fraction desired of equivalent carat, c,

B, the weight of the base metal to be plated.

Then the weight of pure gold deposited on the piece is

$$KX$$

This quantity of gold must be equal to the equivalent amount of gold plated over the whole piece which is cw (B + K).

Therefore, equating the two we get:

$$(1)\quad KX = cw\ (B + X)$$

solving for X gives

$$(2)\quad X = \frac{cw}{K - cw} \cdot B$$

The fraction $\frac{cw}{K - cw}$ we can consider as a factor, F, by which the weight of the base metal is to be multiplied in order to determine what weight of gold alloy should be deposited to conform with the quality desired. To show how this equation works, let us take as a practical example the one given previously. Here, w is .1 and c is 12. As in the previous instance the bath is plating pure gold so K is 24.

$$X = \frac{12 \times .1}{24 - 12 \times .1} \times 100 = 5.263$$

grams of gold.

This is the absolutely correct amount of gold to put on the 100 gram bracelet in order that it conforms with the quality stamping 1/10 — 12k which means 1/10 of the total weight is 12 carat gold. We can check on this: The total weight of the bracelet is now 105.263 grams and 1/10 of this weight is 10.5263 grams of which 50 per cent is pure gold or 5.263 grams to the nearest thousandth.

If the bath were depositing an 18 carat alloy, that is, K is 18, then the total weight of metal that would have to be deposited is

$$\frac{12 \times .1}{18 - 12 \times .1} \times 100 = 7.13 \text{ grams}$$

If platers had to use this formula every time they wanted to know how much gold to put on to conform with

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Uniformity of grain size and shape is clearly shown in this illustration by the uniform length and width of shadow of each individual grain of BOROLON.

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certain quality stamps, a lot of time would be wasted and a lot of tempers ruffled, so the quickest and best way for handling the whole business is to make up a few standard charts that give the values of the factor F for various values of c, w and K.

If, for example, the plant is doing work that is to have the quality stamping of 1/20 — 12k, it is a simple matter to design a chart that gives the value of F for various values of K. Assuming the carat of the plating bath is always maintained at 18 carat plus or minus 1 carat, such a chart would look something as shown in Figure 44.

The plater, then, after weighing off the lot to be plated, consults his chart and multiplies the weight of the load by the appropriate factor. If the plater knows how to use a slide rule, the calculation can be made in less than 30 seconds. The result gives the amount of gold alloy to plate on the work.

Once the weight of gold to be plated out on the load is known, the next step is to control the current and plating time so that this amount of gold will be plated out. This is a fairly easy step if the pieces are of uniform size and shape and fortunately this is the usual case where heavy gold deposits are being plated in production. If the pieces are correctly racked, we may safely assume that each piece in the load gets its fair and equal share of the gold deposit though this is not necessarily so and variations in gold weight may be as high as 10 per cent or more in cases of poor racking. A properly designed gold plating barrel, if it can be used for the job, gives the best distribution of all.[4]

Since the amount of gold deposited varies directly with the current and the time according to Faraday's Law, the best and most accurate results in timing the plating are obtained with an ampere hour meter. A few preliminary tests are made to determine the relative rate of deposition (the cathode efficiency is not 100 per cent and the gold is deposited with other metals). Once this figure is known, the ampere hour meter can be set to govern the deposition of various amounts of gold.

If the current density can be maintained at a constant value for every load (this is only possible where similar pieces are being plated in similar amounts), an interval timing clock may be used in timing the deposits. An experimental run will determine just how much gold alloy is deposited in a given period of time and from this figure all other times can be worked out by proportion. Once the plating time rate is known, the plater puts in the load of work, and sets the clock to ring after a given interval has elapsed. When the bell rings, he knows it is time to pull out the work and he knows he has the correct amount of gold on it. The method is surprisingly accurate.

[4] *See Part 7 of this series.*

Oakite News Service. Of special interest to manufacturing executives is an illustrated, five-page feature article on "The Grinding Process and Its Dependence on Efficient Cooling" which appears in the March-April issue of Oakite News Service, house organ of Oakite Products, Inc., 57 Thames St., New York, N. Y.

Written by Mr. G. Russell Hersam of the Oakite Research Laboratories, the article describes the principal types of grinding and explains some of the "whys" for the high status of this machining process in modern production. Considerable data is also give on the essential part that proper coolants play in assuring desired standards of accuracy, speed, and economy. Copy of Oakite News Service free upon request.

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As there is never a possibility that solutions can creep under the coating, contamination of baths by chromic acid which might have been trapped under the coating is eliminated. WITH THIS PROTECTIVE COATING MATERIAL, IT IS ALWAYS SAFE TO GO FROM BRIGHT NICKEL TO CHROME WITHOUT RERACKING THE WORK.

CONTAINS HIGH SOLIDS — No other coating materials of this type provides the high solids contained in Miccroplastic.

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EASY TO APPLY AND REPAIR—Miccroplastic is applied directly on the metal surface without use of primer. If racks should be damaged in process, the damaged portion alone can be easily repaired.

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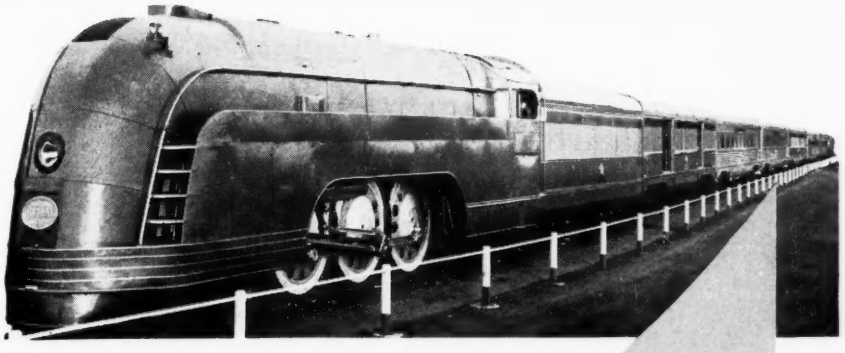
Finishes THAT AID IN APPEARANCE AND UTILITY

(Right) These lithographed meat loaf cans feature beautifully colored pictures of the product contained in each, on the front panels.

(Photo Courtesy Modern Packaging)

(Photo Courtesy Westinghouse Electric & Manufacturing Company)

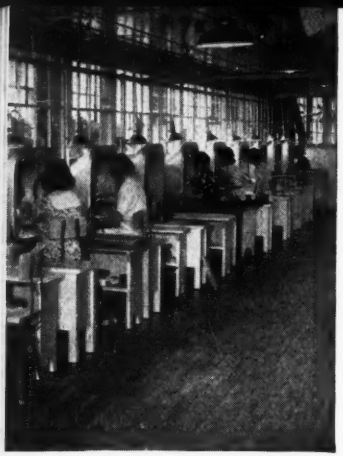
(Left) Two features of this new range model are an ultramodern enameled platform light with chrome trimming, and streamlined white handles, beaded with chrome.



(Photos Courtesy Sherwin-Williams Co.)

(Above) Sidelong view of New York Central's beautifully colored new streamliner, the James Whitcomb Riley, named in honor of Indiana's famous "Hoosier" poet. The speedy, dark gray Pacific-type locomotive with its striking red driving wheels and trim was finished with Sherwin-Williams paints, as well as were the Riley's various cars joined by a vermilion window band on a background of gray with silver stripes.

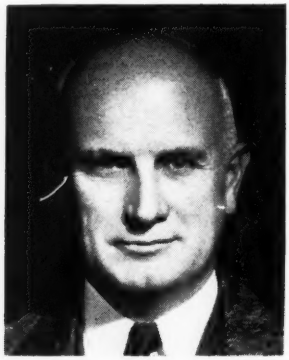
(Left) View of the roomy coach on New York Central's brilliant new Cincinnati-Chicago streamliner, the James Whitcomb Riley. The car is finished in blue, silver and gray, while the adjustable, reclining seats are upholstered in maroon.



News OF THE INDUSTRY

George B. Beitzel Elected President of Philadelphia Sales' Managers Association

George B. Beitzel, manager of sales of the Pennsylvania Salt Manufacturing Company, 1000 Widener Bldg., Philadelphia, Pa., manufacturer of a long line of well-known Pennsalt metal cleaners,



George B. Beitzel

has been elected president of the Sales' Managers Association of Philadelphia and will assume his duties at the Fall meeting of the association.

Mr. Beitzel is well known in the metal-cleaning industry, having been connected with the Pennsylvania Salt Manufacturing Company for the past 11 years, and his selection for this honor will be heartily approved by all of his friends.

Industrial Production Course Offered by Alexander Hamilton Institute

The development of a special training plan for those in industrial production has been announced by the Alexander Hamilton Institute, 13 Astor Place, New York, N. Y. Under the title, "Industrial Production Course and Service," the institute has arranged a short, intensive course on the principles of industrial management.

Intended to meet the demand for men who can supervise the tremendous plant expansion resulting from the National Defense Program, the course is designed for foremen, supervisors, department heads, and other production men who wish to acquire a greater knowledge of production management.

The training, which is given through texts, lectures, problems, and other material, covers all important branches of industrial production, including factory management, production control, cost finding and accounting principles, time and motion study, purchasing and storing.

Porce-Tite Products Occupies New Factory

Porce-Tite Products Inc. has announced the opening of a new enlarged factory located at 3012-14 Archer Ave., Chicago, Ill. In addition to the factory, there will be a display room and laboratory where experiments on various materials will be conducted.

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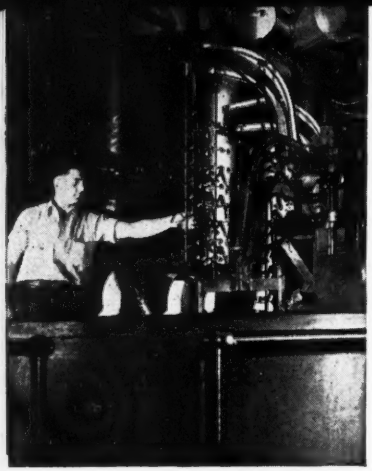
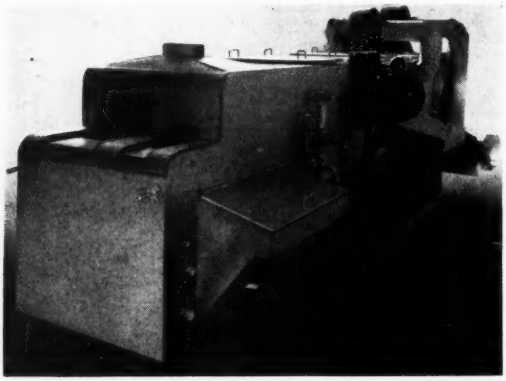


New PLANT EQUIPMENT AND Materials

Ransohoff Small Parts Cleaning Machine

A new cleaning machine is now being manufactured by N. Ransohoff, Inc., 212 W. 71st St., Cincinnati, Ohio. This machine has been designed to wash chips from very fine holes which are drilled in carburetor and fuel pump parts The outstanding feature of this machine is its ability to give each perforation the full benefit of at least two sprays of cleaning compound and rinse water at a 60 ft. head.

The Ransohoff Small Parts Cleaning Machine is equipped with two conveyors of different sizes as shown in the accompanying illustration. The small conveyor carries the carburetor and fuel pump parts through the spraying chamber and the large one conveys tote pans and larger parts. In addition to washing and rinsing, the machine is also provided with blowing off and drying chambers.



Ransohoff Small Parts Cleaning Machine

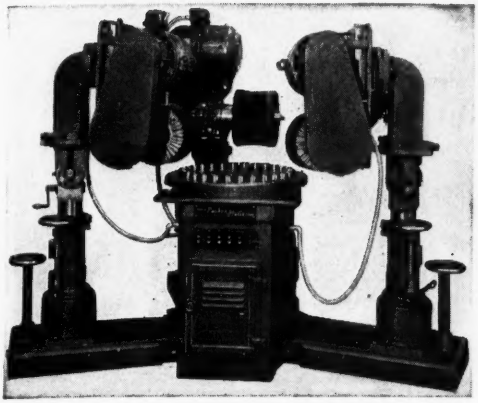
Tygon Corrosion-Resistant Paint

"Tygon" paint is the latest item to be announced by The United States Stoneware Co., P. O. Box 350, Akron, Ohio, as a companion product to "Tygon" linings.

Tygon paint is an all-purpose paint for general industrial use. It is recommended wherever a very highly corrosion-resistant paint is needed, as follows: chemical and process equipment; laboratory walls, tables, and so on; plating, pickling, and etching departments; for protection anywhere, against acid spillage and highly corrosive fumes; and as a floor paint, as a coating over building steel, sprinkler piping, and so on.

Nitric, sulfuric, hydrochloric, hydrofluoric, chronic, and acetic acids are said to have no effect upon Tygon paint. It further resists the action of all plating and pickling solutions.

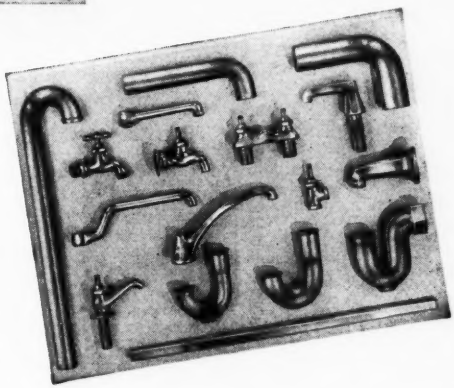
Tygon Corrosion - Resistant paint is available in a wide range of colors. It adheres firmly to concrete or steel.



PLUMBERS BRASS GOODS

Finished *Automatically* on PACKER-MATIC

PACKER-MATIC No. 424
CONTINUOUS ROTARY



• Representative manufacturers of Plumbers Brass Goods are daily using PACKER-MATIC to step-up their production, cut-down Finishing Room costs, produce more efficiently and with uniformly better results on each finished part.

PACKER-MATIC—the *Automatic*, modern method of Polishing and Buffing —has proved its value in scores of industries. Parts both large and small, of irregular shapes and in various metals are Automatically Finished on any of the many types of PACKER-MATIC . . . ROTARY — STRAIGHT LINE CONVEYOR — SINGLE AND DOUBLE ROLL —

WRITE Dept. TS—Send sample Part and Factory Time Study will be sent.

• AUTOMATIC POLISHING & BUFFING MACHINES

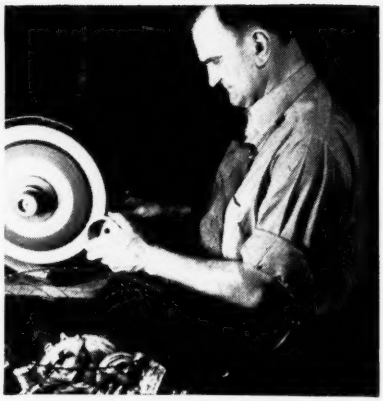
Packer-Matic

THE PACKER MACHINE CO., MERIDEN, CONN., U. S. A.

"Chicago" Improved Soft Rubber Polishing Wheel

An improved soft rubber polishing wheel by means of which highly polished surfaces can be rapidly produced on any base metal is announced by the Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Dept. MM, Chicago, Ill. Five different types of polishing compound are impregnated in a special rubber binder. In addition, the wheel has sufficient cutting grit to remove scratches and grinding marks from the part being polished. Popular sizes and shapes of mounted wheels are available in this soft rubber polishing material.

According to the manufacturer, time required in the finishing of tools, dies, jigs and fixtures with portable equipment is greatly reduced by the use of the "Chicago" Improved Soft Rubber Polishing Wheel. No special equipment is said to be required in using the wheel, which is available in a complete range of sizes, including sticks and sheet form for hand lapping. Conventional dressing tools can be used to dress the face of the wheel to any desired contour so that irregular shaped castings can be polished with ease. Any coolant which is not a solvent of rubber may be used in connection with the wheel where desired, the manufacturer states.



"Chicago" Improved Soft Rubber Polishing Wheel in Use

SPEED UP DRYING PLATED WORK

with

THIS ONE-MAN MACHINE

Increase factory output . . . Lower finishing costs. Let this modern, inexpensive machine solve your drying or lacquering problem.

Fully equipped with reversing drum switch, foot brake, ¾ H.P. motor, V belt drive, it is of all steel electric weld construction occupying 18" x 32" floor space. Gas or steam heating unit optional.

WRITE FOR COMPLETE DETAILS.

DELLINGER MFG. CO.

729 N. Prince St. Lancaster, Pa.

Bruce Polishing and Buffing Lathe

An adjustable and selective speed model polishing and buffing machine has been placed on the market by Bruce Products Corporation, 5712 12th St., Detroit, Mich. The wheel spindle bearings of the unit are of high capacity, precision type, full floating mounted, and effectively enclosed to eliminate leakage of lubricant and entrance of abrasive dust.

Every BUFF Made to Your Order
Deliveries on Schedule

MIDWEST BUFFS

USE MIDWEST

E. 79th ST. & PLATT AVE. CLEVELAND OHIO

The wheel spindles are all precision machined from X1335 SAE alloy steel and each spindle is checked for dynamic balance. All lathes having a maximum speed of 3600 r.p.m. are tested for a critical speed of 4200 r.p.m., thereby allowing a generous margin for a safety factor. Models operating higher than 3600 r.p.m. carry the same generous margin.

A V-belt sheave provided on the wheel spindle is accurately machined and balanced on wheel spindle prior to assembly. Integral with the sheave member is a tubular extension, provided with four slots to permit the plunger type spindle lock pin engaging same in four stations. Sheave is positively anchored to spindle.

V-belts are supplied in matched sets. Two belts are used for 3 h.p., three for 5 h.p., four for 7½ h.p., and five for 10 h.p., all belts of "B" section. Bases are of sufficient weight to provide rigidity and stability for heavy-duty service.

Adjustable speed single or double spindle lathes are equipped with Reeves Moto Drive Internal mechanisms, easily adjusted through the speed ranges by small indicators on the top of the lathe.

Bruce Polishing and Buffing Machine

The shafts on these mechanisms are hard chrome plated and, according to the manufacturer, will not corrode or wear during the life of the machine.

Prestite Porcelain

An electrical porcelain to be known as "Prestite" has been placed on the market by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Prestite is said to combine low cost and high di-

BUILD FASTER AND BETTER

with BLAKESLEE

Parts washers must do a perfect cleaning job in the shortest time and with the least labor. Blakeslee engineered-for-you Metal Parts Washing Machines and Solvent Degreasing Equipment gives you top performance at greatest economy. Blakeslee equipment can "take it" and give years of trouble-free service. Write today on Blakeslee's Metal Parts Washing Machines and Solvent Degreasing Equipment. We have cleaning equipment for every metal cleaning job whether it is production cleaning or for smaller requirements.

Our representative will call immediately at your request.

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mensional fidelity of dry process porcelain with the electrical and mechanical characteristics of wet process material.

The dielectric strength is said to be equal to that of wet process porcelain and under tension and cantilever loads mechanical strength is about 10 per cent greater. Prestite is also said to be impervious to moisture and to have high resistance to heat shock. It is adaptable for intricately shaped pieces, since dimensions can be held accurate within 1½ per cent.

Chromalox Immersion Heater with Thermostat Control

A Chromalox Immersion Heater with thermostat control has been placed on the market by Edwin L. Wiegand Company, 7500 Thomas Blvd., Pittsburgh, Pa. This immersion heater is recommended for sulfuric, hydrofluoric and fluoride solutions, sulfurous compounds, acid copper electroplating solutions, chromium electroplating solutions, and ordinary warm nickel electroplating solutions. Especially recommended for corrosive conditions where lead only is suitable. All immersed parts are lead coated.

A standard immersion heater is enclosed in one leg with a heated section 5½ in. long by 1¼ in. diameter, rated at 500 watts. The second leg, as shown in the illustration, consists of a parallel tube 21 in. long by $\frac{5}{16}$ in. diameter, enclosing the sensitive bulb of a thermostat providing flexible temperature control by means of an adjusting knob. Electrical connections are made within a brass box 4 in. by 2 in. by 2 in. on the top of the heater. Six feet of rubber covered cord and attachment plug are furnished. Over-all dimension of the 500-watt heater is 25 inches.

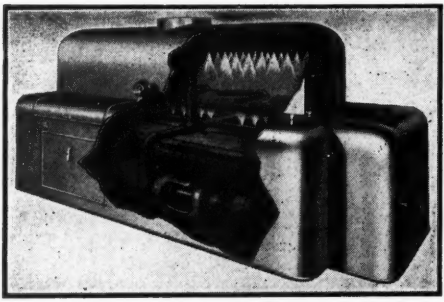
Chromalox Immersion Heater with Thermostat Control

Want to Improve Your Paint Job?

At no extra cost you can give your customers a better, longer-lived paint job. RUSTICIDE "50" not only cleans but also mildly etches and effectively rust proofs the surface. This inexpensive, non-toxic liquid is easy to handle, removes grease and rust, leaving an ideally toothed surface ready for immediate painting. Write us discussing your operation and we will send complete data. Rusticide Products Co., 3125 Perkins Ave., Cleveland, O. Est. 1920.

Thurco Heat Resistant Coatings

The Thurmalox Co., 3107 N. Broad St., Philadelphia, Pa., has placed on the market several heat resisting coatings. These coatings are said to contain pigments that have high resisting and adhesive properties. Thurco coatings are available in aluminum and black for specific applications on mate-



HYDRO-FLOW
Industrial Washing Machines

Streamlined design. Hidden motors, pumps and pipes are easily assembled. Piping and nozzles located to insure thorough cleansing of all surfaces. Rugged and efficient pressure pump. Corrosion resistant spray nozzles—from mist to open stream. Monorail, Belt or Gravity type conveyors designed to carry any shape or size material. Variable speeds on conveyor drive synchronize production.

International Conveyor & Washer Corp.
Write for circular.
640 E. FORT ST. DETROIT, MICH.

rials subjected to temperatures ranging up to 1000 deg. F.

No. 5 black, heat resisting coating is recommended for hot stacks and metal surfaces which are subjected to temperatures up to 800 deg. F. No. 107 black coating can be used on high pressure boilers up to temperatures of 600 deg. F. No. 4 black is designed for underground pipes, water tanks, machinery, and other cold work.

No. 10-L aluminum paint is recommended for interior service on surfaces subjected to temperatures of 800 to 1000 deg. F. No. 2 aluminum stack paint resists temperatures of 600 deg. F. No. 12 aluminum paint can be used for exterior or interior cold work such as tanks, bridges, and so on.

Houghto-Black

A blackening process for steel parts which can be rapidly applied to be known as "Houghto-Black" has been placed on the market by E. F. Houghton & Co., 240 W. Somerset St., Philadelphia, Pa. "Houghto-Black" is a low temperature salt which is mixed with water and held at 290 deg. F. The parts to be blackened are dipped into this bath.

Only a few minutes immersion time is required to produce a lustrous black finish on the steel parts. The manufacturer recommends that parts be chemically clean before immersion takes place. A cold and a hot water rinse follow the bath treatment, after which the parts are said to be ready for assembly. The solution is easily controlled and the finish it produces is said to be unusually durable.

Taylor Ratio Controller

A highly adaptable, easily convertible instrument for applications where a temperature, pressure, rate of flow, or liquid level must be controlled in a desired ratio or differential to another related variable is now offered by the Taylor Instrument Companies, West Ave. and Ames St., Rochester, New York.

With the new direct-setting Taylor Ratio Controller, the ratio is changed by a simple screw driver adjustment directly on a calibrated dial throughout the range of 0:1 to 3:1, direct or inverse. With this new instrument, it is unnecessary to disturb the processing

WALKER'S MODERN PRODUCTION FINISHES

WALKER offers a complete line of Lacquers and Synthetics for every finishing application. Every product has been tried and proven under the exacting conditions of production use.

- **Chromate Primers**
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- **Wrinkle Finishes and a large variety of other decorative, protective and specialty finishes.**

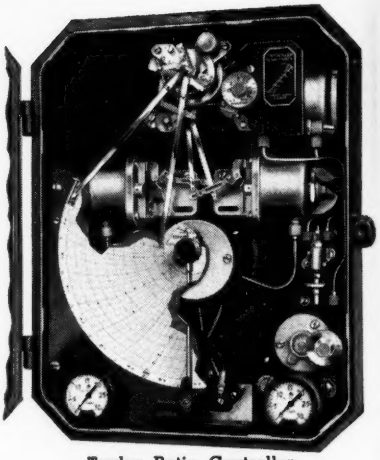
Walker's Modern Production Finishes may offer an immediate solution to your present finishing problem. A wire, letter or phone call will receive prompt attention. Remember to "Call on Walker."

H. V. WALKER CO.
MODERN PRODUCTION FINISHES
Elizabeth, New Jersey

or remove the chart plate while making ratio adjustments.

The Taylor Ratio Controller has two measuring systems, one the adjusting system which indicates or records only; and the other, the controlling system, which may either indicate or record. The adjusting system resets the control point of the controlling system through a linkage arrangement according to a predetermined ratio. The action of the controlling system is the same as the 120R Series Fulscopes and may be used as a single duty bi-recording controller when the ratio setting is zero.

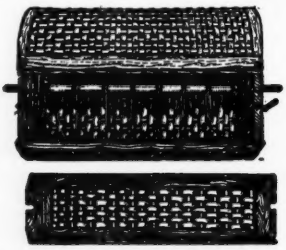
Both indicating and recording models of the Ratio Controller are available with all the features of the 120R Series Fulscope—fixed high sensitivity, adjustable sensitivity, adjustable sensitivity with automatic reset, adjustable sensitivity with pre-act, and adjustable sensitivity with automatic reset and pre-act.



Taylor Ratio Controller

INVESTIGATE
FOR SOMETHING
BETTER
SIZES FOR ANY EQUIPMENT

KING



PLATING BARRELS

Write for illustrated folder.
Use them once—you'll use them always

JOHN KING
48 SPRINGFIELD ST., DAYTON, OHIO

Kidde Trigger Control Feature

Speedier fire fighting operation has been added to the four pound carbon dioxide extinguisher recently announced by Walter Kidde & Company, Inc., 37 West St., Bloomfield, N. J. The trigger control valve, developed by this company for its two pound unit, is now standard equipment on the new-type four pounder.

Like its predecessor, this extinguisher is discharged by simply pulling a trigger. This type of discharge control not only permits the extinguisher to go into action faster, but also insures no wasting of the carbon dioxide gas while the operator is maneuvering around the blaze. When trigger pressure is released, the discharge is shut off.

The nozzle arm is equipped with a swivel, so that the discharge horn is held in a "down" position when the extinguisher is not in use. For use, the

ROBERTS Says: **YOU GET WHAT YOU'RE AFTER** when you deal with us. Our reputation for quality and service, and our long list of satisfied customers are your guarantees that we will back up our promises with performance. We invite you to put us to the test.

THE ROBERTS ROUGE CO., Specialists in manufacturing thoroughly dependable Gold, Sterling and Silver Plate Rouges; Stainless Steel, Chrome and Crocus Compounds. STRATFORD, CONN.

Kidde Trigger Control Feature

operator swings the horn into discharge position, takes aim at the fire and pulls the trigger.

The cylinder of this new Kidde-Lux is considerably oversized permitting greater ease in recharging and, as an added safety factor, gives increased tolerance for high temperatures, if the extinguisher is used near stoves, furnaces, and so on.

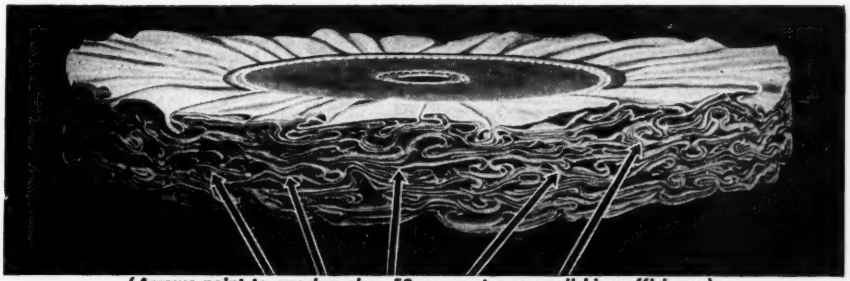
The Kidde-Lux Model No. 4 is designed especially for protection of laboratories, trucks, garages, and smaller hazards involving electrical or flammable liquid fires.

Dustkop 600 Dust Collector

A unit type dust collector to be known as the "Dustkop 600" has been placed on the market by Aget Manufacturing Co., 424 Book Bldg., Detroit, Mich. This dust collecting unit has a 600 c.f.m. rating and is designed to exhaust one or more pedestal or bench type polishing and buffing machines. Being entirely self-contained and not requiring connecting in with a centralized collecting system, the Dustkop 600 is said to permit rapid installation and subsequent moving of the machine and collector as a unit.

The Dustkop 600 is equipped with a ¼ h.p., 3,450 r.p.m. rubber mounted 110 volt motor. The unit is sufficiently compact to be mounted on the base of a grinder, as shown in the illustration, or on the floor behind the polishing and buffing machine.

Two types of intake flanges are available to exhaust stations—singly or in



(Arrows point to overlap ply—50 per cent more polishing efficiency)

Better *Buffing* at less cost

That is the idea — the sole principle — underlying the design and construction of BIAS Buffs.

This OVERLAP PLY Type "A" Buff shown above has proved 100 per cent in economy and efficiency wherever it has been used, in comparison with ordinary buffs.

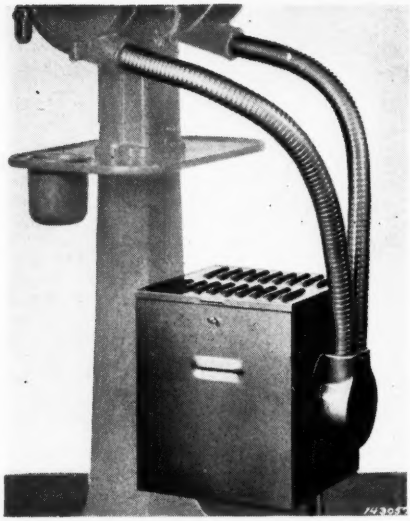
Ask the users of BIAS BUFFS!

We urge a trial of Type "A" on your work.

Greetings to Everyone at the Boston Convention. You'll see some of our boys there.

The BIAS BUFF *and* WHEEL CO., Inc.

430 Communipaw Ave. Jersey City, N. J.



Dustkop 600 Dust Collector

multiple when placed close together. When connected with a single polishing unit, two lengths of standard 1⅝ in. flexible hose can be used to make a slip fit between the two-way intake flange and the outlet of the wheel shield. When employed to serve more than one station, an intake flange to accommodate a five inch pipe elbow is supplied.

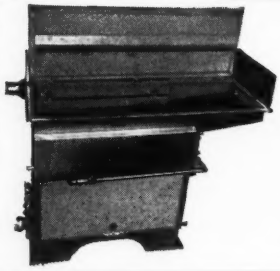
Removal of the collected dust and dirt can be effected by taking off a louvered cover, removing the filter assembly, and lifting the pan, into which the dust has fallen after being stopped by the filter. Filters are made of spun glass and are said to stop over 99 per cent of the dust. A completely assembled Dustkop 600 unit consists of motor, fan filter unit, plug-in electrical cord connection, and intake flange for either a two-way or single five inch connection.

Milburn Ply No. 6

A waterproof ointment for the prevention of skin disorders caused by contact with acids and caustic compounds in both dry and aqueous form to be known as Ply No. 6 has been placed on the market by The Milburn Company, 905 Henry St., Detroit, Mich. Ply No. 6 is an ointment which can be applied over the exposed parts of the skin, leaving a thin white film, but in no way interfering with the efficiency of the men or the process in which it is involved. It serves as an effective protection against strong sulfuric, muriatic, nitric, hydrocyanic, and many other acids. Laboratory tests show perfect resistance to as high as a 20 per cent concentration of nitric acid. Strong, caustic metal cleaners, soaps, biologicals, dyes, dye intermediaries, insecticides, rubber compounds and impurities, explosives and metal salts are also hazards which are said to be nullified through the use of Ply No. 6.

Some of the ingredients in Ply No. 6 are specially treated with violet-ray exposure to change the molecular structure of the ointment and strengthen its resistance to the above mentioned materials. This treatment eliminates the necessity for including in Ply any insoluble elements which are liable to clog up the pores or hair follicles, or sources of infection and incapacitation.

Ply No. 6 requires only a thin application over the areas which are exposed. It has been estimated that a single pound of the substance will last, under average working conditions, from four



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We can build a "D'OILER" (manual or automatic) to handle your degreasing jobs swiftly and economically. May we send you complete details?

You should use D'OILENE in your degreaser.

MECHANICAL PROCESS CO.

Specialists in the use and handling of chlorinated solvents

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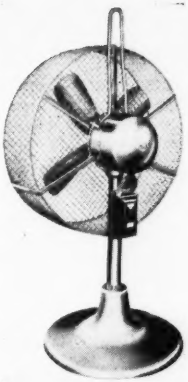
to five months. Ply No. 6 is easily removed with ordinary soap and warm water at the end of each working period. In common with all other Ply products, Ply No. 6 is harmless to the skin.

ILG Heavy-Duty "Man Cooling" Fan

A 36-in. heavy-duty portable floor fan which is said to hurl a tremendous blast of air in a straight line is offered by the ILG Electric Ventilating Co., 2850 N. Crawford Ave., Chicago, Ill. The ILG portable floor fan is self-contained, completely equipped, and is especially valuable in "man cooling" capacities. It can be placed anywhere, affording a practical and economical means of relief to workmen in areas of intense heat. A 90-ft. blast of cooling, refreshing air cuts right through "hot spots," closely confined departments, and hot - air pockets.

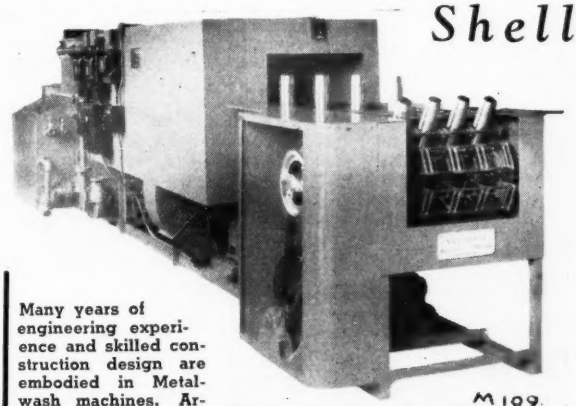
The ILG portable floor fan is equipped with a cast-iron base of extra-heavy construction and has a very low center of balance. It can be safely moved on a scoop truck, and a hook is also provided so that it can be moved by a crane if desired. A starting switch completes the equipment on the fan.

The propeller is of the four-blade type, of one-piece metal construction, keyed to the motor shaft. Heavy steel mesh guards cover the fan in front and back, providing complete protection of fan and user.



ILG Heavy-Duty "Man Cooling" Fan

The 36-in. heavy-duty model weighs 675 lbs., attains 1140 r. p. m., and circulates air at a rate of 24,000 cut. ft. per min. The over-all height is 67 inches. The guard diameter is 43 in., the base diameter, 32 inches. Other models of the "man-cooling" portable floor fans, with the same general features but not of extra-heavy construction, are available in sizes of 36, 30, 24, and 12 inches. The



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Reduce Your Cleaning Costs By using Automatic SHELL CLEANING and Drying MACHINES

Many years of engineering experience and skilled construction design are embodied in Metalwash machines. Arsenals and firms engaged in National Defense Work are using our products. We invite interviews on engineering problems in this field. Write us.

Models in operation for various sized projectiles from 20 mm. to 155 mm. These sturdy machines are built for fast action and big scale production.

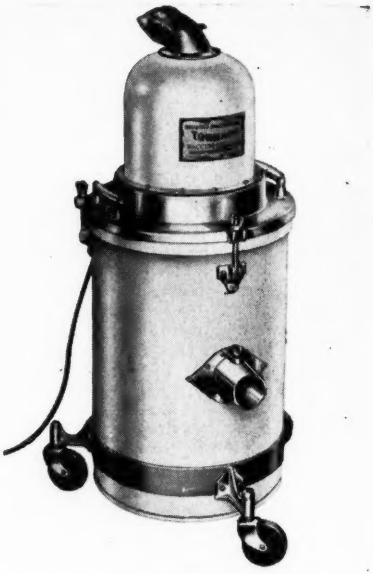
METALWASH MACHINERY Co., Inc.
27-29 HAYNES AVE. NEWARK, N. J.

12-in. size is furnished with extension plug and cord.

The ILG ventilating fan self-cooled motor is claimed to combine the low operating cost of the open motor with the protection of the fully enclosed motor. The ILG self-cooled motor is an open motor, protected and enclosed by a metal hood. The fan action draws clean air through the vent-pipe from the outside, circulates it through the motor and exhausts it. The motor therefore stays clean and cool, according to the manufacturer; no foul air reaches it.

Tornado Model 230 Noiseless Portable Vacuum Cleaner

A noiseless portable vacuum cleaner known as the "Tornado Noiseless Model 230" has been announced by the Breuer Electric Mfg. Co., 5100 N. Ravenswood Ave., Chicago, Ill. The outstanding feature of this machine is its combination of extremely quiet operation, great power, and ease of handling. The motor and fan noise has been reduced to a negligible factor. Only the sound of the air rushing through the nozzle and cleaning tools is audible a few feet away.



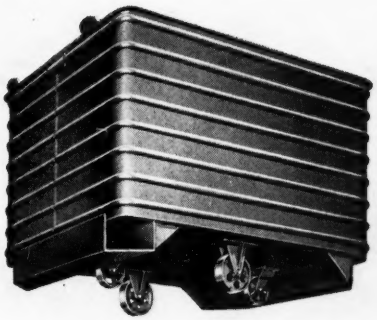
Tornado Model 230 Noiseless Portable Vacuum Cleaner

The Tornado Noiseless Model 230 is designed for heavy duty service and is equipped with a full horsepower motor mounted on grease sealed ball bearings which require no oiling. The multistage, turbine fan has ample suction for fast, thorough cleaning, and the large tank and filter provide sufficient space for dirt accumulation. The machine is light in weight (50 lb.) so that it can be easily rolled about on its large casters or picked up and carried when necessary.

A wide variety of attachments are available for various types of industrial cleaning, such as the cleaning of walls, overhead pipes, and so on; the removing of dust, chips, and litter from units in the course of assembly, and the cleaning of boiler tubes and boiler tops in power plants.

Union Tiering Dump Box

A corrugated steel box, designed especially for use with lift trucks equipped with revolving type forks, has been introduced by the Union Metal Manufacturing Company, Canton, Ohio.



Union Tiering Dump Box

Special fork pockets are welded to the bottom at either end and run the full length of the box. When the forks are inserted in these two pockets, the box can be lifted, turned completely over for dumping, then righted again.

The top flange of the box can be equipped with tiering or crane lugs for efficient storage and handling. Ends of the pockets are cut at a 45 deg. angle so that they do not extend beyond the sides. Casters facilitate short spottings and permit box to be moved easily between machines. Rugged, all-steel construction, combined with the dumping feature, makes this unit particularly suited to handling scrap, small metal parts, castings, and various loose materials.

Allied Waterproofing Compound

A waterproofing compound to be known as "U-Mix-It" has been placed on the market by Allied Asphalt & Mineral Corp., 215 Broadway, New York, N. Y. This material can be applied in thinned form as paint or in heavy consistency with putty knife or trowel. It is recommended for waterproofing, damp-proofing, leak repairing, and so on.

U-Mix-It may be mixed with kerosene, gasoline, turpentine, or other solvents to form a paint which can be brushed or sprayed on the surface to be treated. The compound is said to have excellent adhesion to the material on which it is applied. Depending upon the solvent used, U-Mix-It sets hard or remains in plastic state indefinitely.

It's the Last Word

IN PLATING ROOM PRACTICE!

UNICHROME* "AIR DRY" RACK COATING

No special equipment required to use this rack insulation that is remarkably resistant to wear, hot cleaners and all plating solutions

Unichrome "AIR-DRY" Rack Coating is new—but it has been tried and proved in all types of service! Racks coated with it have gone through hundreds of plating cycles and are still as good as new!

In fact, Unichrome Air Dry Rack Coating has all the advantages of the best rack insulation you ever heard of—including that of being AIR DRYING. Hot dipping and force drying are eliminated.

Here are the seven big time- and money-saving advantages at a glance:—

INSOLUBLE—withstands hot cleaners and all plating solutions

SAFE—contains no ingredients harmful to plating solutions

TOUGH—withstands wear and tear of handling

FLEXIBLE—withstands repeated flexing and bending

DURABLE—reduces the need for re-coating

CONVENIENT—any part can be patched without recoating the entire rack

EASILY APPLIED—dipping is done in the container in which it is shipped—the material dries at room temperature.

Address requests for further information or a trial order to the nearest office below.

UNITED CHROMIUM
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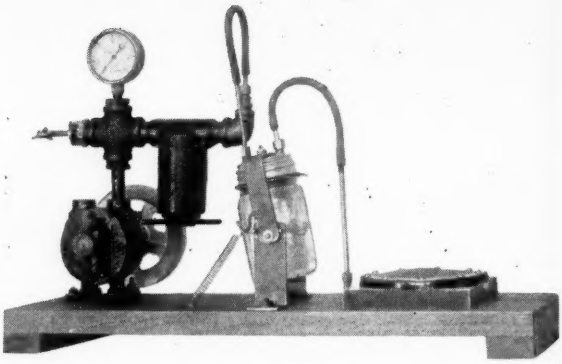
Leiman Bros. Vacuum Tester



Leiman Bros. Vacuum Tester

To facilitate the testing valves and other closely fitted parts, pumps, or other operating devices which must show varying degrees of tightness, Leiman Bros., Inc., 101 - W - 6 Christie St., Newark, N. J., has brought out the vacuum testing device shown in the illustration The apparatus is said to be extremely accurate and is so designed that the work can be done with unusual speed no matter how small or how large the device under test may be.

In use, a rubber-faced disc or table is arranged so that the article to be tested is pressed down on its surface while the operator watches the vacuum dial to note the degree of vacuum being created on the interior of the tested article. When a predetermined degree is reached, the operator tips the suspended water jar slightly by hand, submerging the small tube inside the jar, which will create bubbles in the water if there is the slightest leak in the article under test.

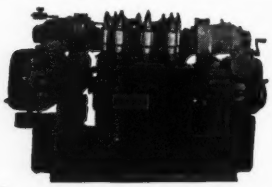
The device is made in sizes according to the size of the articles to be tested, the smallest and most frequently used size being used for testing valves up to 4½-in. outside diameter, or equivalent. The device consists of a small rotary vacuum pump, either with or without motor drive, rubber-faced testing block, tilting water jar, air strainer, vacuum relief valve and vacuum gage, all complete in a single unit occupying a space of approximately 8 x 25 inches.

The blowing outlet of the air pump may be used for operating blow pipes, gas furnaces, or appliances; agitating liquids; blowing chips, and many other purposes.

Penn-Kelsey Steel Locker Unit

Illustrated is a group of steel constructed lockers, designated as the Penn-Kelsey Unit, which provides complete facilities for 10 persons in half the floor space ordinarily required. This unit is now being marketed by Penn Metal Corporation of Penna., 36 Oregon Ave., Philadelphia, Pa. Such an arrangement of lockers releases extra floor space for productive purposes and provides maximum ventilation, it is said.

Each low-cost, portable unit has an open coat space 56½ in. high with the



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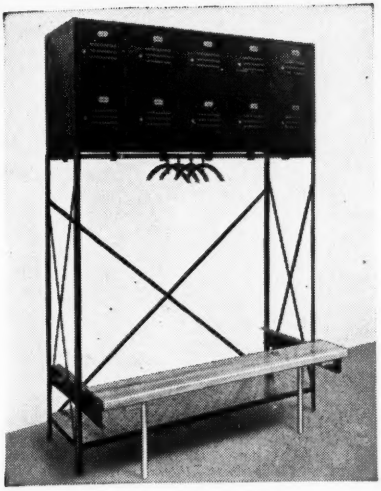

Penn-Kelsey Steel Locker Unit

coat hangers permanently attached to the rod. There is a perforated metal shoe rack at the bottom, a wooden seat, 8½ in. wide and 18 in. above the floor and attached to the frame, and 10 private, locked compartments, each of which is 12 in. wide, 18 in. deep and 12½ in. high.

Doors are flanged on all sides for strength, with three ventilating louvres per door. Optional locking arrangements are a flat key lock with bevel spring-bolt or dead bolt, a spring-bolt combination lock, or a padlock.

Heavy furniture steel is used in the assembly, with compartment door frame members spot welded for strength and rigidity. Nuts and bolts are cadmium plated to resist corrosion. Rubber bumper silencers are employed at contact points. Over-all size of each unit is 60 in. wide, 18 in. deep and 87 in. high, accommodating 10 persons.

Burns Burring Compound

A compound which is said to aid in the removal of burrs on stampings, castings, or forgings has been placed on the market by E. Reed Burns Manufacturing Corporation, 40 Withers St., Brooklyn, N. Y. Burns Burring Compound can be used with a Tampico bristle brush, preferably oiled, or a conventional type, circularly sewed rag wheel. A brush is suggested for work which is irregular in shape or which has deep contours, while the hard cloth wheel is excellent for flat work and large areas.

The binder in Burns Burring Compound is said to be readily emulsifiable, and will clean easily either by the degreaser method or in the regular cleaning solution before plating or other finishing. The material is gray in color and is available in bars weighing 3¾ lbs. each.

Imperial No-Wash Remover

A paint remover to be known as "Imperial No-Wash Remover" has been placed on the market by Wilson-Imperial Co., 113 Chestnut St., Newark, N. J. This material is said to have excellent solvent power and permits removal of several paint coats with one scraping. No after washing is required and quick clean up with rags or steel wool is all that is necessary. According to the manufacturer, a new finishing material can be applied immediately after removing old paint.

Imperial No-Wash Remover is said to

"MAGIC" TACK RAGS IMPROVE YOUR FINISH 100%

MAGIC TACK RAGS remove specks, lint and sand particles--- bring out that deep, smooth luster, produce a faultless surface for white or colored finish. Why use "home made" tack rags when you can buy MAGIC TACK RAGS at trifling cost! They are tackier, do not dry--- are dust-proof and spontaneous combustion proof. Packed in dozen and gross lots or more. Made only by the

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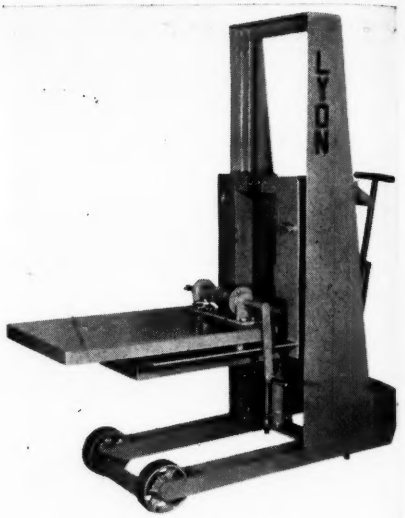
stay wet, thus permitting application over large areas before starting to strip. The material is said to contain no acid or alkali.

Lyon Truck with Hydraulic Elevating and Revolving Table

The Lyon Iron Works, 701 Madison St., Greene, N. Y., has introduced a rather unique design of hydraulic die handling truck. The truck has a revolving table arranged to revolve with stops at each 90 deg. When in its standard position, the table extends about 1 ft. beyond the edge of the wheels so that the table may be placed close to a press when taking dies out or putting dies into the press, particularly those presses where the base of the press extends out beyond the bed of the press. This arrangement is also very convenient when taking dies on and off shelves where the lower shelves may have dies stored on them that protrude beyond the edge of the shelves. The table is equipped with a winch for pulling dies on and off of the table.



Lyon Truck with Hydraulic Elevating and Revolving Table

The truck shown in the illustration is of 1,000-lb. capacity and has a table of 24 x 36 in.—31 in. to winch, with lowered height of 12 in., elevated height of 51 in., and two-speed hydraulic hand pump. The truck can also be furnished in other capacities and specifications and with a motor-driven pump instead of two-speed hydraulic hand pump.

Yale Y4RP-9 Pallet Truck

The Yale & Towne Mfg. Co., Philadelphia Division, Philadelphia, Pa., announces the development of a hand-operated pallet truck to be known as

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Mar proof and alkali proof. Bakes from 150 F. to 450 F. in 10 to 30 minutes.
High reflection test. **Forever white**

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meet the highest standards of the plating industry . . . Anodes and chemicals for every kind of plating.

THE HARSHAW CHEMICAL CO.
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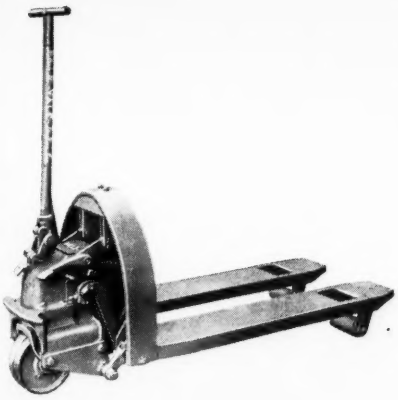

Yale Y4RP-9 Pallet Truck

the Y4RP-9. According to the manufacturer, the truck brings the economies of pallet-load handling of materials within the scope of hand truck operations. It also serves as a valuable supplement to electric truck handling, being particularly useful for short hauls and close quarter operations.

Among the many features of the Y4RP-9 truck is an effortless lift through a multiple stroke lifting mechanism. For easy roll and smooth operation, all wheels are ball bearing equipped. Safety to load, truck, and floors is assured through a positive locking device and hydraulic release check which cushions every descending load.

The Yale Y4RP-9 Pallet Truck is designed to provide easiest possible entry between pallet decks. The rollers and wheels on the fork frame are so spaced in relation to each other that when the wheels are over an empty deck space, the rollers are supporting the truck by solidly resting on one of the boards of the lower pallet deck. In this manner, the usual wheel drop is said to be eliminated.

The Y4RP-9 truck is made in frame widths of 25, 27, and 30 in., and in frame lengths of 36, 42, 48, 54, and 60 in. Load capacities range up to 4,000 pounds.

National Air Sander

Air operated for safety and incorporating a non-stalling motor, the air sander shown in the illustration herewith, product of National Air Sander, Inc., 2710-12 W. State St., Rockford, Ill., is adaptable for wet or dry sanding operations in all types of finishing. The motor is sealed in rubber and operates on pre-lubricated ball bearings.

Handle design assures firm grip for two-hand operation. Instant starting trigger fits the palm of the hand, with the hand close to work for positive control and guidance.

The National Air Sander has an op-

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Formulated specifically for the following properties:

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3. Tenacious adhesion
4. Hardness combined with flexibility

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RUST RESISTANCE

S-310

is used and recommended as a clear coating for hand tools, machine tools, hardware and wherever a clear protective coat for bright metal is required.

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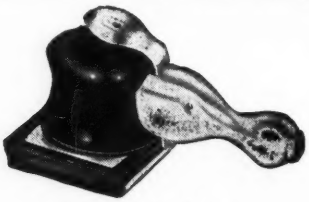
5208 Harvard Ave. Cleveland, Ohio

erating speed of 5,000 cycles per minute and is furnished complete with two interchangeable pads, one for wet and one for dry sanding. Time and paper



National Air Sander

are said to be saved since pads need only be changed when changing from one type of sanding operation to the other.

Electrobrite

Increased smoothness and reflectivity of polished stainless and rustless steel is said to be obtained when a compound known as "Electrobrite" which is being marketed by The Franklin Oil & Gas Co., Box 127, Bedford, Ohio, is added to the electroplating bath. Use of the compound is said to allow reduction in current density and operating voltage of baths, and to eliminate foaming and fuming. Irregular or round shapes are said to be polished uniformly.

Electrobrite is available in various grades depending upon the current and temperature used and finish desired.

R-S Butterfly Valve for Air, Gas, Steam, and Liquid Control

Illustrated is a handwheel operated Butterfly Valve for air, gas, steam, and liquid control which is now being marketed by R-S Products Corp., 4530 Germantown Ave., Philadelphia, Pa. The internal parts of this valve are machined to assist operation and to obtain a tight fit between housing and vane. The line includes a standard range of sizes from 2 to 48 in. for working pressures up to 15 pounds.

A feature in the design lies in the pair of adjustable stops which are provided to stop the vane in either of two set positions between "open" and "closed." This permits constant duplication of any set maximum or minimum opening, in addition to full-open and tight-closed positions. All valves have a graduated dial and pointer for the exterior determination of the butterfly vane.

R-S Butterfly Valve for Air, Gas, Steam, and Liquid Control

The handwheel assembly operates through a self-locking worm and quadrant and is arranged on the side of the housing so the wheel can be located in the most convenient position. Wheels, worm, and quadrant can be omitted and a lever connected directly to the butterfly vane shaft for hand-lever operation.

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Best For Infra-Red Ray Drying
Nalco Dritherm Lamps are the carbon filament type...proved for years in therapeutic and industrial practice as providing maximum emanation of infra-red ray within the desirable penetrating band. Made only by—
NORTH AMERICAN ELECTRIC LAMP CO.
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For a real good polishing job use
KEYSTONE EMERY
TURKISH — NAXOS — AMERICAN
KEYSTONE EMERY MILLS *Write for Sample* **4316 Paul St., Phila, Pa.**

Yale & Towne 4½-Ton "Pul-Lift" Hoist

The Philadelphia Division of The Yale & Towne Mfg. Co., Philadelphia, Pa., announces the addition of a hoist having a 4½-ton capacity to its line of "Pul-Lift" portable hoists. As a result, "Pul-Lifts" can now be obtained in a complete range of capacities of from ¾ ton to 6 tons, the intermediate capacities being 1½, 3, and 4½ tons.

Yale & Towne 4½-Ton "Pul-Lift" Hoist

The 4½-ton Pul-Lift hoist has the same safety and construction features as the previously announced models. It is light in weight, thereby making it easily portable, yet is said to be strong and rugged enough to more than adequately handle jobs within its rated capacity. The great strength combined with the lightness of weight is due to the use of new type alloy steels.

The roller chain used in the "Pul-Lift" hoist is specially designed and is claimed to have an ultimate strength of approximately five times the rated capacity of the hoist. The Pul-Lift can be operated equally well in either a horizontal or vertical position, thereby making it useful for both pulling and lifting as well as for practically any type maintenance work. In addition, the Pul-Lift features the famous Yale safety hooks. In case of severe overload, these hooks are said to open slowly without fracture, thereby giving ample visual warning of danger and positive protection to the operator, the load, and the mechanism.

For operation in close quarters and out-of-the-way places, the Yale & Towne 4½-Ton Pul-Lift Hoist has a ratchet handle with a universal action. Short, easy strokes at any point within a complete circle permit operation in the most limited quarters. Possibility of flying handle is decreased to a minimum by the self-actuated load brake of the Pul-Lift. As the load is increased, brake pressure increases in direct proportion.

Plant View Book. Abrasive Company, Division of Simonds Saw & Steel Co., Philadelphia, Pa., is now publishing an illustrated Plant View Book showing in complete detail the various manufacturing processes and plant facilities used in the production of Abrasive Company Grinding Wheels and abrasive materials. The book is 11 x 14 in. in size and contains 24 pages.

Copy of Plant View Book will be sent free of charge to any plant executive or operating official addressing a request on his company letterhead.

Dust Engineering. Vol. 5, No. 1, of "Dust Engineering" is now being issued by American Air Filter Co., Inc., 240 Central Ave., Louisville, Kentucky. Included in this issue is information

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Made from the highest quality selected ores obtainable in this country and in the same careful and thorough manner as imported emeries.
These rough-surfaced, solid-shaped grains hold unusually well in the glue.
Write for full details.
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on the following subjects: Windowless factories, the ultimate in air cleaning, controlling grinding dust from casting finishing, advantages of filtered air in finishing rooms, the dust problem in abrasive cleaning, dry type filter uses, eliminating vapors and fumes, cleaning intake air from engines and compressors, isolated dust problems, and engineering data on air filtration and dust control.

A copy of "Dust Engineering" will be sent free upon request.

Reeves Hydraulic Automatic Control. Reeves Pulley Co., Dept. MS, Columbus, Ind., has prepared a six-page bulletin telling how completely automatic variable speed control for many machine operations and industrial processes can be obtained by means of the Reeves Hydraulic Automatic Control in connection with the Reeves Variable Speed Transmission. The bulletin illustrates and describes the construction, features, operation, and so on, of the control and also shows its application in the textile industry. Copy free upon request.

Brown System for Plating Tanks. The Brown Instrument Company, Wayne and Roberts Aves., Philadelphia, Pa., is now issuing a bulletin describing a new system of instrumentation for plating tanks. This system fundamentally involves direct control of the temperature of the water which is circulated through pipe coils or water jacket rather than indirect control of the circulating water from the temperature of the plating solution.

The electrode deposition of metals such as chromium, copper, nickel, cadmium, and so on, is more effectively and economically accomplished if the plating solution or bath is maintained at a temperature consistent with the desired conductivity or "throwing power" of the solution. Depending upon the materials being used and the results desired, variations of only a few degrees from the optium temperature cause appreciable changes in the lustre and color of the finish and in the density and depth of the plate.

This new system offers the following features: Maintains a uniform plating temperature; saves on amount of steam and cold water necessary due to closeness of temperature control; longer life obtained from the control thermometer because bulb is not subjected to a destructive action of the plating solution. When bulbs are installed directly into the plating tank, their useful life is materially shortened by the destructive action of the plating solution; not necessary to sacrifice valuable space in plating tank for installation of bulb; not necessary to electrically insulate bulb and connecting tubing from sides of tank, hence no danger of bulb failures from electrolysis.

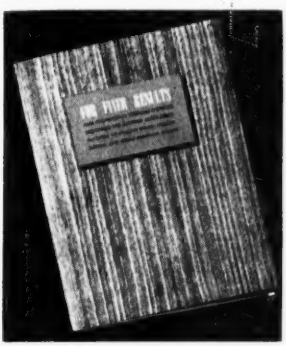
The bulletin fully describes the system and contains a schematic drawing of the hook-up of the temperature control system for plating tanks and actual chart records of the bath temperature controlled from circulating water.

A copy of this bulletin will be sent free upon request.

Ault & Wiborg Wood Grain Booklet. A new brochure describing an improved method of reproducing wood grains on both metal and wood surfaces is being issued by Ault & Wiborg Corporation, New York City.

The brochure is enclosed in a special

wood grain cover, which is printed in a walnut on the outside and an amboyna burl pattern on the inside. The various applications of the new wood graining



Ault & Wiborg Wood Grain Booklet

method are outlined, and there are illustrations of its use on automobile moldings, on metal furniture, and wall panels, and on the backs of wood brushes.

Manufacturers may obtain copies of the brochure by writing Ault & Wiborg at 75 Varick St., New York City.

"Rubber and Its Use." This is the title of a book that grew out of the experiences of Dr. Harry L. Fisher during his 17 years as a research chemist and as a lecturer on the chemistry and technology of rubber. The Chemical Publishing Co., Inc., 236 King St., Brooklyn, N. Y., is now offering copies of this book at $2.25 each.

Rubber and Its Use should prove most interesting and useful not only because of its authoritative and practical treatment, but because its style is such that it can be read and easily understood by anyone.

Not only is the naturally occurring rubber discussed and described in this interesting book but the new developments in synthetic rubber, rubber that is made from products that never saw the inside of a tree, are covered. When one thinks that a natural source of rubber may no longer be available at some time in the future, then the importance of synthetic rubber becomes obvious.

Dr. Harry L. Fisher is exceptionally qualified to write about rubber and its use. He has taught chemistry at Columbia University, and he has been at the head of the organic research chemists in the laboratories of The B. F. Goodrich Co. and U. S. Rubber Co. Today he is director of organic research of the U. S. Industrial Chemicals, Inc., and the Air Reduction Co. He is the author of numerous articles on rubber chemistry, the author of "Laboratory Manual of Organic Chemistry;" a prolific lecturer on organic and rubber chemistry; the inventor of many processes in rubber technology, especially relating to materials and methods of attaching rubber to metal and new rubber derivatives.

Dr. Fisher received the 1940 Modern Pioneer Award and is president of the American Institute of Chemists.

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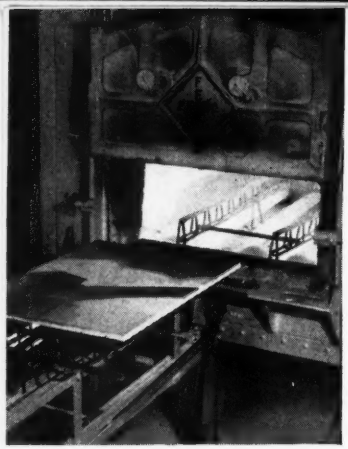

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To obtain copies of the catalogs listed here, indicate on the coupon the number of the item in which you are interested and mail as directed.

1. General Electric Heating Cable Bulletin GEA-3539

A four-page bulletin describing applications and specifications of General Electric Heating Cable is now being issued by General Electric Company, Schenectady, New York.

2. Detroit Handy "Tac" Rags

Philco Specialties Co., 418 N. San Pedro St., Los Angeles, Calif., is now issuing a folder describing tack rags for use in all finding processes.

3. Ideal Products Catalog

A 24-page catalog describing and illustrating products manufactured by the Ideal Commutator Dresser Co., 1270 Park Ave., Sycamore, Ill., is now being issued by this company.

4. Clark Pictorial

A 16-page illustrated catalog showing various applications of Clark handling equipment is now being issued by Clark Tructractor Div. of Clark Equipment Co., Battle Creek, Michigan.

5. Taylor Slide Comparators

Taylor Slide Comparators for pH, chlorine, and phosphate control, and also water analysis are described in a six-page folder which is now being issued by Platers Research Company, 59 E. 4th St., New York City.

6. Wayne Chemical Products Folder

A folder containing literature describing the various products manufactured by Wayne Chemical Products Company, 9448 Copeland Ave, Detroit, Mich., is now being issued free upon request.

7. Infra-Red Radiant Application

A four-page folder on the subject of "Infra-Red Radiant Heat Application" —what it is, how it works, and why it is different is now being published by Birdseye Lamp Sales Division, Wabash Appliance Corporation, 335 Carroll St., Brooklyn, New York.

8. Hammond Variable Speed Lathe

A four-page folder illustrating and describing a method by which speed changes of 1,500 to 3,000 r.p.m. can be obtained instantly on the Hammond VRO Polishing and Buffing Lathe is now being issued by Hammond Machinery Builders, Inc., 1622 Douglas Ave., Kalamazoo, Michigan.

9. Orvus for Alkaline Cleaning Baths

All those engaged in metal cleaning operations will be interested in information regarding an alkaline cleaning bath addition agent known as Orvus now being distributed by Procter & Gamble Co., Gwynne Bldg., Cincinnati, Ohio.

10. Du Pont High Speed Brass
The Electroplating Division of E. I. du Pont de Nemours & Company, Wilmington, Del., is now issuing a catalog describing an electroplating process for the rapid production of smooth, bright brass deposits.

11. Dust Control
A complete story of dust control in words and pictures by means of Roto-Clone dust control equipment is now being issued by American Air Filter Company, Inc., 702 Central Ave., Louisville, Kentucky.

12. Finishes for Jewelry and Novelties
Five standard finishes for jewelry and novelties, rhodium, white gold No. 2, Wite brass, and gold smut base finishes are described in a folder which is now being issued by the Alrose Chemical Company, 80 Clifford St., Providence, Rhode Island.

13. Finishing Equipment Catalog.
A very complete catalog illustrating and describing finishing equipment of all kinds is now being issued by Industrial Sheet Metal Works, 630 E. Forest Ave., Detroit, Michigan.

14. Industrial Ovens
An illustrated industrial oven book featuring safety, speed, economy, and efficiency in industrial drying and finishing processes is now being issued by The Kirk & Blum Mfg. Co., 2816 Spring Grove Ave., Cincinnati, Ohio.

15. Milburn Gas and Air Regulators
A special portfolio describing Milburn single, two-stage, and ball seat type gas and air regulators is now being issued by The Alexander Milburn Company, 1436 W. Baltimore St., Baltimore, Md.

16. Cleaning of Metals Before Electroplating
A 32-page booklet outlining formulas and methods for cleaning many different metals and alloys before electroplating is now being issued by Oakite Products, Inc., 20 Thames St., New York City.

17. Grinding Wheel Data Book
A 112-page catalog containing complete descriptive information about the manufacture, use and application of grinding wheels is now being issued by Abrasive Company, Tacony and Fraley Sts., Philadelphia, Pennsylvania.

18. Textured Enamel Finish
An improved textured enamel finish known as Rincontrol is fully illustrated and described in a folder now being issued by Roxalin Flexible Lacquer Co., Inc., Box 713, Elizabeth, New Jersey.

19. Hy-Speed Filter Equipment for Plating Solutions
An 8-page catalog now being issued by Alsop Engineering Corporation, 8 Bright St., Milldale, Conn., describes an entirely new approach to the problem of keeping plating solutions clean.

20. Metal Cleaning Tips
The chemical classification and selection of alkaline metal cleaners is contained in a bulletin which has been prepared and is now being distributed by the Cowles Detergent Company, 7016 Euclid Ave., Cleveland, Ohio.

21. Airway Ventilated Buffs
Cool cutting buffs for high speed buffing operations are illustrated and described in a 4-page folder now being distributed by Jackson Buff Corporation, 20-03 41st Ave., Long Island City, New York.

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